GROUP 13A

MULTIPORT FUEL INJECTION (MFI)

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GENERAL INFORMATION

M1131000103056

The Multiport Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE CONTROL MODULE (ECM) which controls the system based on signals from these sensors, and actuators which operate under the control of the ECM.
The ECM carries out activities such as fuel injection control, idle air control, and ignition timing control.
In addition, the ECM is equipped with several diagnostic test modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injection timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.
A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank to the fuel injectors by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The regulated fuel is distributed to each of the injectors.
Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft.
The firing order is 1-3-4-2. Each cylinder has a dedicated fuel injector. This is called multiport.
The ECM provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance.In addition, when the engine is under normal operating temperature after warming-up, the ECM controls the air/fuel mixture by using the heated oxygen sensor signal to carry out "closed-loop" control. The closed-loop control achieves the theoretical air/fuel mixture ratio where the catalytic converter can obtain the maximum cleaning performance.

THROTTLE VALVE OPENING CONTROL

This system electrically controls the opening of the throttle valve. The ECM detects the amount of travel of the accelerator pedal via the accelerator pedal position sensor, and controls the actuation of the throttle actuator control motor, which is mounted on the throttle body, in order to attain the target throttle valve opening that has been predetermined in accordance with driving conditions.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that passes through the throttle valve in accordance with changes in idling conditions and engine load during idling.
The ECM drives the throttle actuator control motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and A/C and other electrical load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the throttle actuator control motor adjusts the throttle valve pass-through air amount according to the engine load conditions to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ECM from engine speed, intake air volume, engine coolant temperature, and atmospheric pressure.

DIAGNOSTIC TEST MODE

- When a fault is detected in one of the sensors or actuators related to emission control, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates to warn the driver.
- When a fault is detected in one of the sensors or actuators, a diagnostic trouble code corresponding to the fault is stored in the ECM.
- The RAM data inside the ECM that is related to the sensors and actuators can be read with the scan tool. In addition, the actuators can be controlled by scan tool MB991958 (M.U.T.-III sub assembly) under certain circumstances.

OTHER CONTROL FUNCTIONS

Fuel Pump Control

- Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.

A/C Compressor Clutch Relay Control

- Turns the compressor clutch of the A/C ON and OFF.

Engine Oil Control Valve Control

- The ECM carries out the duty control of the engine oil control valve according to the operation condition. This varies the phase angle of the camshaft to optimize the valve timing.

Generator Output Current Control

- Prevent generator output current from increasing suddenly and idle speed from dropping at times such as when the headlights are turned on.

Evaporative Emission Purge Control

- (Refer to GROUP 17, Emission Control System – Evaporative Emission Control System –General Information P.17-76.)

EGR Control <California>

- (Refer to GROUP 17, Emission Control System – Exhaust Gas Recirculation (EGR) System - General Information <California> P.17-81.)

MULTIPORT FUEL INJECTION (MFI) SYSTEM DIAGRAM

<Except for California>

Sense

- ★1 Mass airflow sensor
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor (main/sub)
- ★4 Manifold absolute pressure sensor
- ★5 Engine coolant temperature sensor
- ★6 Intake camshaft position sensor
- ★7 Exhaust camshaft position sensor
- ★8 Crankshaft position sensor
- ★9 Knock sensor
- ★10 Heated oxygen sensor (front)
- ★11 Heated oxygen sensor (rear)
- ★12 Fuel tank differential pressure sensor
- ★13 Fuel tank temperature sensor

- ● Accelerator pedal position sensor (main/sub)
- ● Engine oil pressure switch
- ● Power steering pressure switch
- ● Generator FR terminal
- ● Generator L terminal
- ● Vehicle speed sensor <M/T>
- ● Ignition switch-IG
- ● Ignition switch-ST
- ● Power supply
- ● CAN communication (input signal)

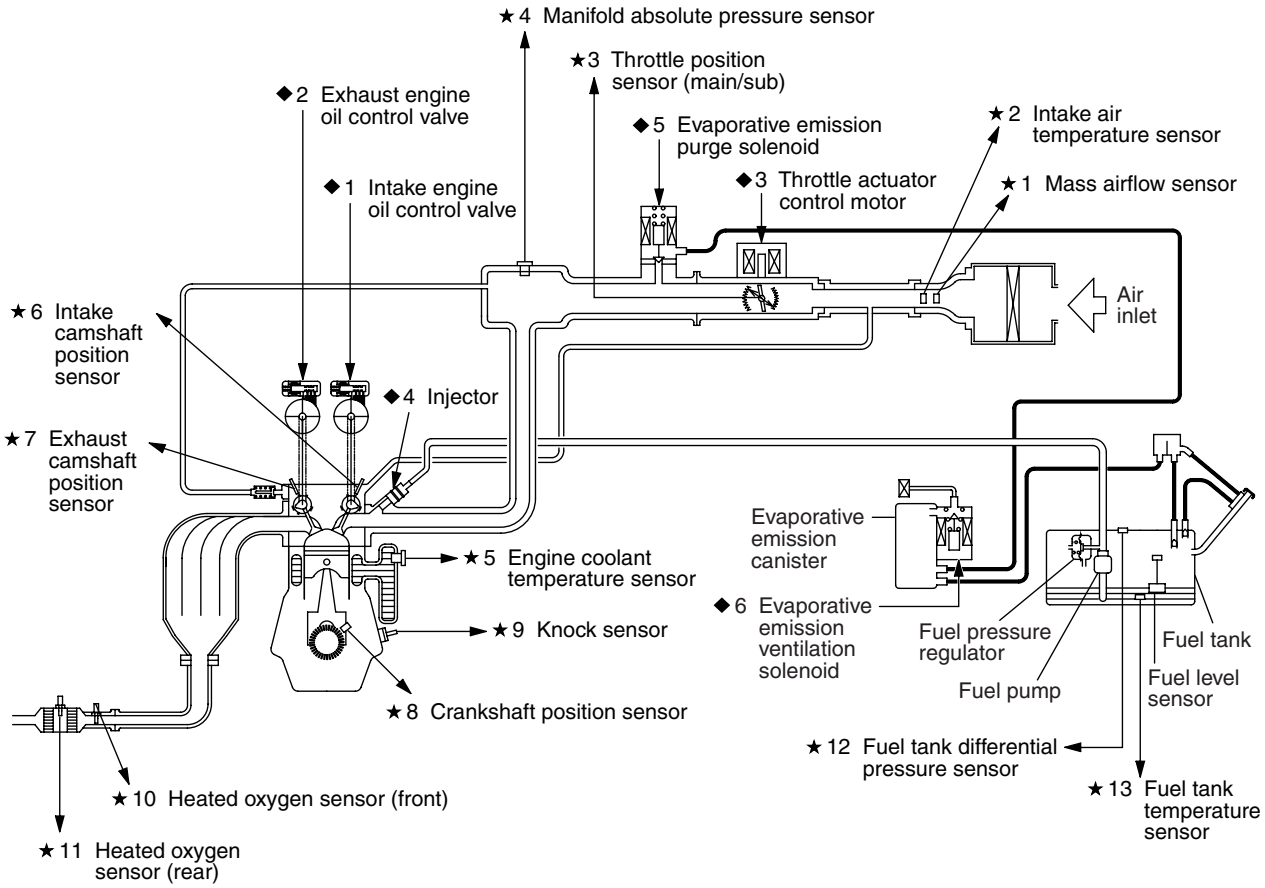
Decide

ECM (with barometric pressure sensor)

Act

- ◆1 Intake engine oil control valve
- ◆2 Exhaust engine oil control valve
- ◆3 Throttle actuator control motor
- ◆4 Injector
- ◆5 Evaporative emission purge solenoid
- ◆6 Evaporative emission ventilation solenoid

- ● Ignition coil, ignition power transistor
- ● Multiport fuel injection (MFI) relay
- ● Fuel pump relay
- ● Starter relay
- ● Throttle actuator control motor relay
- ● Generator G terminal
- ● Heated oxygen sensor heater
- ● A/C compressor relay
- ● Diagnostic output
- ● CAN communication (output signal)



AK604117AB

NOTE: For the vacuum routing, refer to GROUP 17, Emission Control –Vacuum Hoses –Vacuum Hose Routing P.17-72.

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<California>

Sense

- ★1 Mass airflow sensor
- ★2 Intake air temperature sensor
- ★3 Throttle position sensor (main/sub)
- ★4 Manifold absolute pressure sensor
- ★5 Engine coolant temperature sensor
- ★6 Intake camshaft position sensor
- ★7 Exhaust camshaft position sensor
- ★8 Crankshaft position sensor
- ★9 Knock sensor
- ★10 Heated oxygen sensor (front)
- ★11 Heated oxygen sensor (rear)
- ★12 Heated oxygen sensor (3rd)
- ★13 Fuel tank differential pressure sensor
- ★14 Fuel tank temperature sensor

- ● Accelerator pedal position sensor (main/sub)
- ● Engine oil pressure switch
- ● Power steering pressure switch
- ● Generator FR terminal
- ● Generator L terminal
- ● Vehicle speed sensor <M/T>
- ● Ignition switch-IG
- ● Ignition switch-ST
- ● Power supply
- ● CAN communication (input signal)

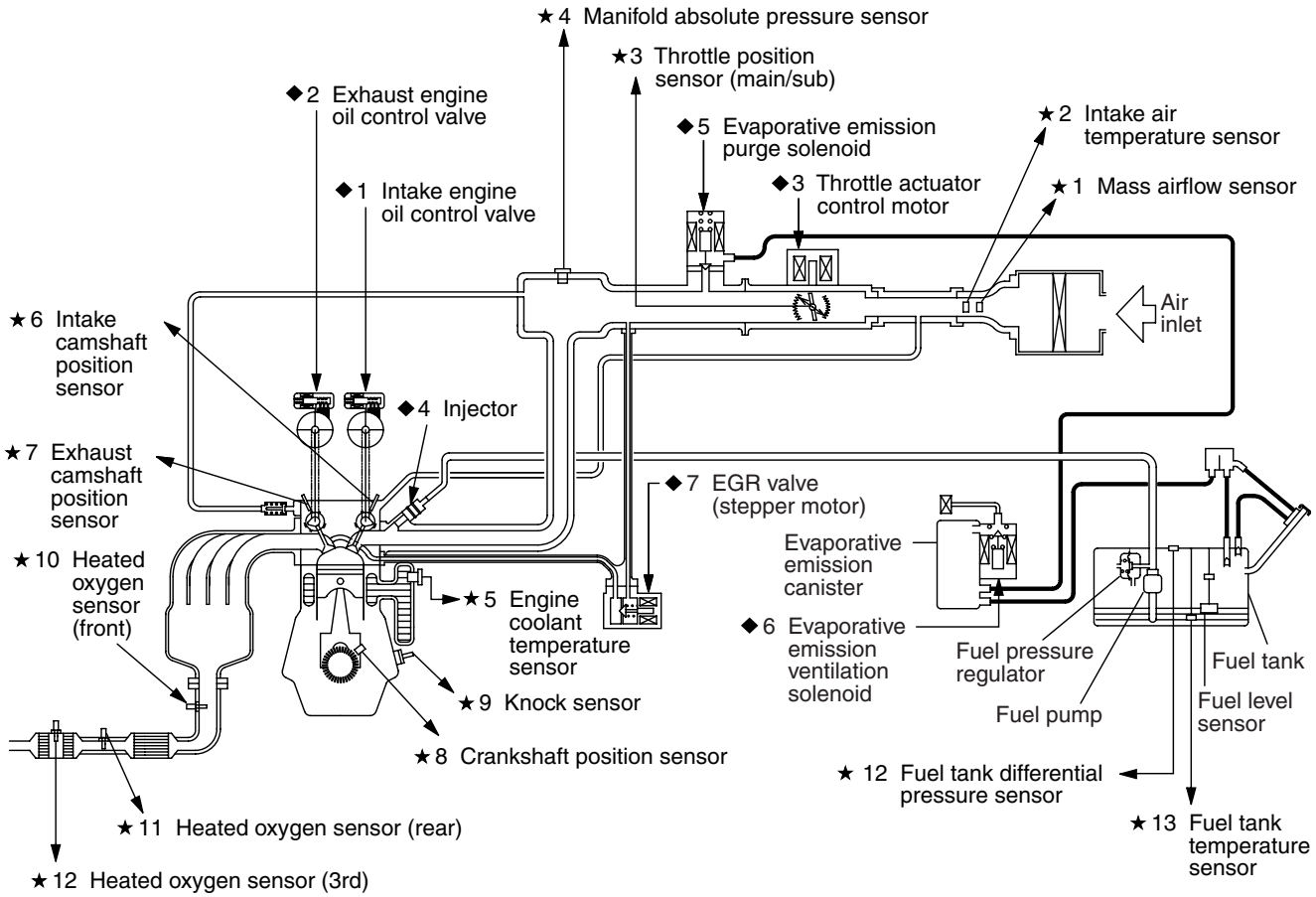
Decide

ECM (with barometric pressure sensor)

Act

- ◆1 Intake engine oil control valve
- ◆2 Exhaust engine oil control valve
- ◆3 Throttle actuator control motor
- ◆4 Injector
- ◆5 Evaporative emission purge solenoid
- ◆6 Evaporative emission ventilation solenoid
- ◆7 EGR valve (stepper motor)

- ● Ignition coil, ignition power transistor
- ● Multiport fuel injection (MFI) relay
- ● Fuel pump relay
- ● Starter relay
- ● Throttle actuator control motor relay
- ● Generator G terminal
- ● Heated oxygen sensor heater
- ● A/C compressor relay
- ● Diagnostic output
- ● CAN communication (output signal)



AK604118 AB

NOTE: For the vacuum routing, refer to GROUP 17, Emission Control –Vacuum Hoses –Vacuum Hose Routing P.17-72.

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GENERAL SPECIFICATIONS

M1131000201109

ITEMS			SPECIFICATIONS
Throttle body	Throttle bore mm (in.)		63 (2.48)
	Throttle position sensor		Hall element type
	Throttle actuator control motor		DC motor type, having brushes
Engine control module (ECM)	Identification model No.	Except for California	E6T71571 <M/T> E6T71572 <CVT>
		California	E6T49585 <M/T> E6T49586 <CVT>
Sensors	Mass airflow sensor		Heat sensitizing type
	Barometric pressure sensor		Semi conductor type
	Intake air temperature sensor		Thermistor type
	Engine coolant temperature sensor		Thermistor type
	Heated oxygen sensor		Zirconia type
	Accelerator pedal position sensor		Hall element type
	Transmission range switch		Contact switch type
	Camshaft position sensor		Magneto resistance element type
	Crankshaft position sensor		Magneto resistance element type
	Knock sensor		Piezoelectric type
	Power steering pressure switch		Contact switch type
	Manifold absolute pressure sensor		Semiconductor type
Actuators	Multiport fuel injection (MFI) relay		Contact switch type
	Fuel pump relay		Contact switch type
	Throttle actuator control motor relay		Contact switch type
	Injector type and number		Electromagnetic type, 6
	Injector identification mark		JME240B
	EGR valve		Stepper motor type
	Evaporative emission purge solenoid		Duty cycle type solenoid valve

SERVICE SPECIFICATIONS

M1131000301805

ITEMS		STANDARD VALUE
Fuel pressure kPa (psi)		Approximately 324 (47) at curb idle
Intake air temperature sensor resistance kΩ	–20° C (-4° F)	13 –17
	0° C (32° F)	5.3 –6.7
	20° C (68° F)	2.3 –3.0
	40° C (104° F)	1.0 –1.5
	60° C (140° F)	0.56 –0.76
	80° C (176° F)	0.30 –0.45
Engine coolant temperature sensor resistance kΩ	–20° C (-4° F)	14 –17
	0° C (32° F)	5.1 –6.5
	20° C (68° F)	2.1 –2.7
	40° C (104° F)	0.9 –1.3
	60° C (140° F)	0.48 –0.68
	80° C (176° F)	0.26 –0.36
Heated oxygen sensor output voltage V		0.6 –1.0
Heated oxygen sensor heater resistance Ω	Front, Rear	4.5 –8.0
	3rd	11 –18
Injector coil resistance Ω		10.5 –13.5 [at 20° C (68° F)]
Throttle actuator control motor coil resistance Ω		0.3 –80 [at 20° C (68° F)]

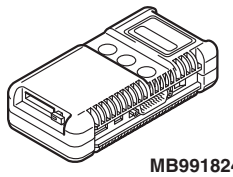
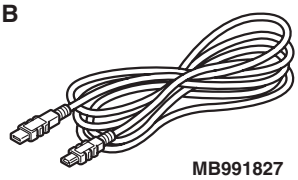
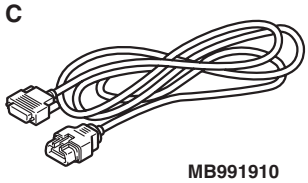
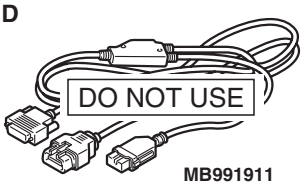
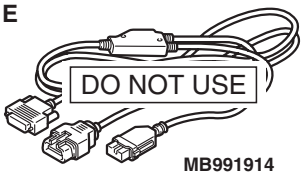
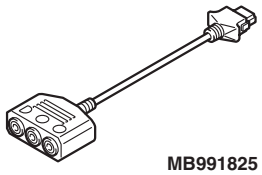
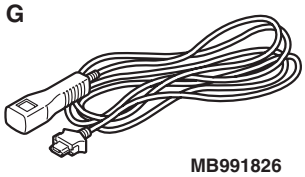
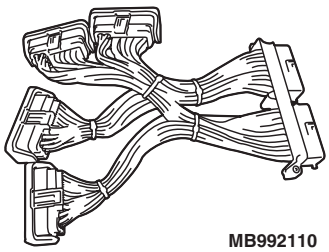
SEALANT AND ADHESIVE

M1131000501188

ITEM	SPECIFIED SEALANT
Engine coolant temperature sensor threaded portion	LOCTITE 262 or equivalent

SPECIAL TOOL

M1131000601958

Tool	Tool number and name	Supersession	Application
A  MB991824 B  MB991827 C  MB991910 D  DO NOT USE MB991911 E  DO NOT USE MB991914 F  MB991825 G  MB991826 MB991958	MB991958 A: MB991824 B: MB991827 C: MB991910 D: MB991911 E: MB991914 F: MB991825 G: MB991826 M.U.T.-III sub assembly A: Vehicle Communication Interface (V.C.I.) B: M.U.T.-III USB Cable C: M.U.T.-III Main Harness A (Vehicles with CAN communication system) D: M.U.T.-III Main Harness B (Vehicles without CAN communication system) E: M.U.T.-III Main Harness C (for Daimler Chrysler models only) F: M.U.T.-III Measurement Adapter G: M.U.T.-III Trigger Harness	MB991824-KIT *NOTE: G: MB991826 M.U.T.-III Trigger Harness is not necessary when pushing V.C.I. ENTER key.*	• Reading diagnostic trouble code • MFI system inspection • Measurement of fuel pressure **⚠ CAUTION** **For vehicles with CAN communication, use M.U.T.-III main harness A to send simulated vehicle speed. If you connect M.U.T.-III main harness B instead, the CAN communication does not function correctly.**
 MB992110	MB992110 Power plant ECU check harness	–	• Inspection using an oscilloscope • Inspection of the engine control module (ECM) terminal voltage check

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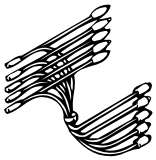
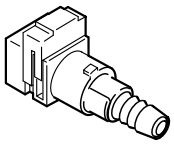
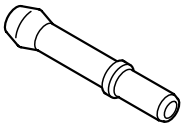
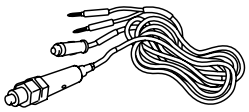
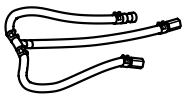
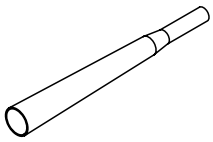
Tool	Tool number and name	Supersession	Application
	MB991709 Test harness	MB991709-01	Inspection using an oscilloscope
 MB991658	MB991658 Test harness	Tool not available	• Inspection using an oscilloscope • Inspection of heated oxygen sensor • Inspection of engine oil control valve
	MB991316 Test harness (4 pin, square)	Tool not available	Inspection of heated oxygen sensor
 MB992049	MB992049	MB992049-01	Measurement of fuel pressure
 MB992001	MB992001	Hose adaptor	Measurement of fuel pressure
 MB991981	MB991981 Fuel pressure gauge set	Tool not available	Measurement of fuel pressure
 MB992076	MB992076	Injector test set	Measurement of fuel pressure
	MB992106 O-ring installer	-	Installation of O-ring on injector injection nozzle side

MULTIPORT FUEL INJECTION (MFI) DIAGNOSIS

TROUBLESHOOTING STRATEGY

M1131150001862

NOTE: If a DTC is erased, its "freeze frame" data will also be erased and system readiness test status will be reset. Store the "freeze frame" data before erasing the DTC.

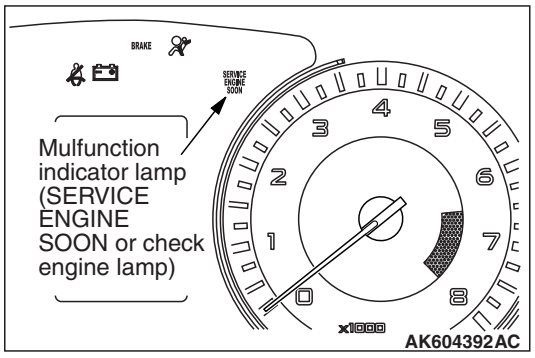
Use these steps to plan your diagnostic strategy. If you follow them carefully, you will be sure to have exhausted most of the possible ways to find an MFI fault.

1. Gather as much information as possible about the complaint from the customer.
2. Verify that the condition described by the customer exists.
3. Check the vehicle for any MFI Diagnostic Trouble Code (DTC).
4. If you cannot verify the condition and there are no DTCs, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
5. If you can verify the condition but there are no DTCs, or the system cannot communicate with the scan tool, refer to the trouble symptom classification table.
6. If there is a DTC, store the number of the code, then erase the code from the memory using the scan tool.
7. Reconfirm the malfunction symptom and carry out a test drive with the drive cycle pattern.
8. If DTC is set again, carry out an inspection with appropriate diagnostic trouble code procedures.
9. If DTC is not set again, the malfunction is intermittent. For information on how to cope with intermittent malfunctions, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
10. After repairs are completed, conduct a road test duplicating the complaint set conditions to confirm the malfunction has been corrected.

NOTE: If the engine control module (ECM) is replaced, Immobilizer Encrypted Code Registration should be carried out, refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

DIAGNOSTIC FUNCTION

M1131155502014



MALFUNCTION INDICATOR LAMP (SERVICE ENGINE SOON OR CHECK ENGINE LAMP)

Among the on-board diagnostic items, Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates to notify the driver of an emission control malfunction. However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will switch off.

Immediately after the ignition switch is turned on, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is lit for 20 seconds to indicate that the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) operates normally.

NOTE: When the Transmission Control Module (TCM) detects malfunctions related to the CVT, the Malfunction indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is also illuminated.

Items Indicated by the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)

DTC	ITEM
P0011	Intake variable valve timing system target error
P0014	Exhaust variable valve timing system target error
P0016	Crankshaft/camshaft (intake) position sensor phase problem
P0017	Crankshaft/camshaft (exhaust) position sensor phase problem
P0031	Heated oxygen sensor (front) heater circuit low
P0032	Heated oxygen sensor (front) heater circuit high
P0037	Heated oxygen sensor (rear) heater circuit low
P0038	Heated oxygen sensor (rear) heater circuit high
P0043	Heated oxygen sensor (3rd) heater circuit low <California>
P0044	Heated oxygen sensor (3rd) heater circuit high <California>
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor
P0101*	Mass airflow circuit range/performance problem
P0102*	Mass airflow circuit low input
P0103*	Mass airflow circuit high input
P0106	Manifold absolute pressure circuit range/performance problem
P0107	Manifold absolute pressure circuit low input
P0108	Manifold absolute pressure circuit high input
P0111*	Intake air temperature circuit range/performance problem
P0112*	Intake air temperature circuit low input
P0113*	Intake air temperature circuit high input
P0116*	Engine coolant temperature circuit range/performance problem
P0117*	Engine coolant temperature circuit low input
P0118*	Engine coolant temperature circuit high input
P0122*	Throttle position sensor (main) circuit low input
P0123*	Throttle position sensor (main) circuit high input
P0125*	Insufficient coolant temperature for closed loop fuel control
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)
P0131	Heated oxygen sensor (front) circuit low voltage
P0132	Heated oxygen sensor (front) circuit high voltage
P0133	Heated oxygen sensor (front) circuit slow response
P0134*	Heated oxygen sensor (front) circuit no activity detected
P0137	Heated oxygen sensor (rear) circuit low voltage
P0138	Heated oxygen sensor (rear) circuit high voltage
P0139	Heated oxygen sensor (rear) circuit slow response
P0140	Heated oxygen sensor (rear) circuit no activity detected
P0143	Heated oxygen sensor (3rd) circuit low voltage <California>
P0144	Heated oxygen sensor (3rd) circuit high voltage <California>

DTC	ITEM
P0145	Heated oxygen sensor (3rd) circuit slow response <California>
P0146	Heated oxygen sensor (3rd) circuit no activity detected <California>
P0171	System too lean
P0172	System too rich
P0181	Fuel tank temperature sensor circuit range/performance
P0182	Fuel tank temperature sensor circuit low input
P0183	Fuel tank temperature sensor circuit high input
P0201	Injector circuit –cylinder 1
P0202	Injector circuit –cylinder 2
P0203	Injector circuit –cylinder 3
P0204	Injector circuit –cylinder 4
P0222*	Throttle position sensor (sub) circuit low input
P0223*	Throttle position sensor (sub) circuit high input
P0300	Random/multiple cylinder misfire detected
P0301	Cylinder 1 misfire detected
P0302	Cylinder 2 misfire detected
P0303	Cylinder 3 misfire detected
P0304	Cylinder 4 misfire detected
P0335*	Crankshaft position sensor circuit
P0340*	Intake camshaft position sensor circuit
P0365*	Exhaust camshaft position sensor circuit
P0401	Exhaust gas recirculation flow insufficient detected <California>
P0420	Warm up catalyst efficiency below threshold <Except for California>
P0421	Warm up catalyst efficiency below threshold <California>
P0441	Evaporative emission control system incorrect purge flow
P0442	Evaporative emission control system leak detected (small leak)
P0443	Evaporative emission control system purge control valve circuit
P0446	Evaporative emission control system vent control circuit
P0450	Evaporative emission control system pressure sensor malfunction
P0451	Evaporative emission control system pressure sensor range/performance
P0452	Evaporative emission control system pressure sensor low input
P0453	Evaporative emission control system pressure sensor high input
P0455	Evaporative emission control system leak detected (gross leak)
P0456	Evaporative emission control system leak detected (very small leak)
P0461	Fuel level sensor circuit range/performance
P0462	Fuel level sensor circuit low input
P0463	Fuel level sensor circuit high input
P0489	EGR valve (stepper motor) circuit malfunction (ground short) <California>
P0490	EGR valve (stepper motor) circuit malfunction (battery short) <California>
P0500*	Vehicle speed sensor malfunction <M/T>

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DTC	ITEM
P0506	Idle control system RPM lower than expected
P0507	Idle control system RPM higher than expected
P0551	Power steering pressure switch circuit range/performance
P0554	Power steering pressure switch circuit intermittent
P0603*	EEPROM malfunction
P0606*	Engine control module main processor malfunction
P0630*	Vehicle Identification Number (VIN) malfunction
P0638*	Throttle actuator control motor circuit range/ performance
P0642*	Throttle position sensor power supply
P0657*	Throttle actuator control motor relay circuit malfunction
P1021	Intake engine oil control valve circuit
P1025	Exhaust engine oil control valve circuit
P1233*	Throttle position sensor (main) plausibility
P1234*	Throttle position sensor (sub) plausibility
P1235*	Mass airflow sensor plausibility
P1236*	A/D converter
P1237*	Accelerator pedal position sensor plausibility
P1238*	Mass airflow sensor plausibility (torque monitor)
P1239*	Engine RPM plausibility
P1241*	Torque monitor
P1320	Ignition timing retard insufficient
P1506	Idle control system RPM lower than expected at low temperature
P1507	Idle control system RPM higher than expected at low temperature
P1590*	TCM to ECM communication error in torque reduction request <CVT>
P1603*	Battery backup circuit malfunction
P1676*	Variant coding
P2100*	Throttle actuator control motor circuit (open)
P2101*	Throttle actuator control motor magneto malfunction
P2122*	Accelerator pedal position sensor (main) circuit low input
P2123*	Accelerator pedal position sensor (main) circuit high input
P2127*	Accelerator pedal position sensor (sub) circuit low input
P2128*	Accelerator pedal position sensor (sub) circuit high input
P2135*	Throttle position sensor (main and sub) range/performance problem
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem
P2195	Heated oxygen sensor inactive (sensor 1)
P2228*	Barometric pressure circuit low input
P2229*	Barometric pressure circuit high input
P2252	Heated oxygen sensor offset circuit low voltage
P2253	Heated oxygen sensor offset circuit high voltage
P2423	HC adsorber (HC trap catalyst) efficiency below threshold <California>

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DTC	ITEM
U0101*	CVT-ECU time-out
U0141*	ETACS-ECU time-out
U1180*	Combination meter time-out

NOTE: If the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates because of a malfunction of the engine control module (ECM), communication between the scan tool MB991958 (M.U.T.-III sub assembly) and the ECM is impossible. In this case, the diagnostic trouble code cannot be read.

NOTE: After the ECM has detected a malfunction, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates when the engine is next turned on and the same malfunction is re-detected. However, for items marked with a "" in the DTC NO. column, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates only on the first detection of the malfunction.*

NOTE: After the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminates, it will be switched off under the following conditions.

- When the ECM monitored the powertrain malfunction three times* and met set condition requirements, it detected no malfunction. *: In this case, "one time" indicates from engine start to next engine start.
- For misfiring or a fuel trim malfunction, when driving conditions (engine speed, engine coolant temperature, etc.) are similar to those when the malfunction was first recorded.

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine. Also, sensor 3 indicates the sensor mounted at the position third closest to the engine.

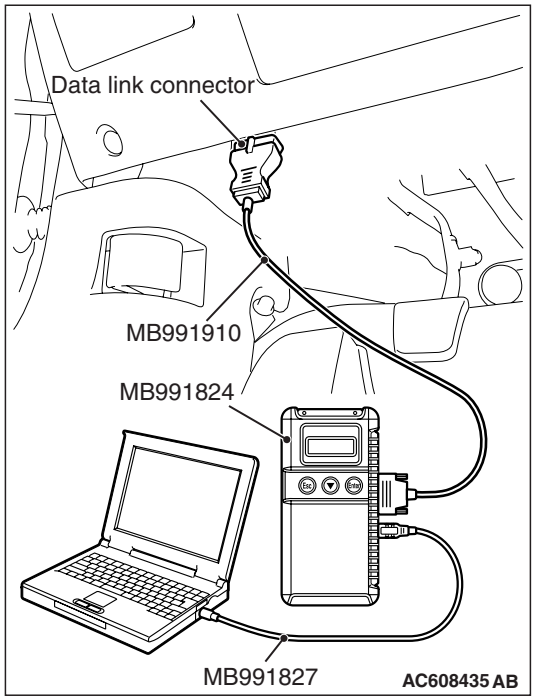
HOW TO CONNECT THE SCAN TOOL (M.U.T.-III)

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



1. Ensure that the ignition switch is at the "LOCK" (OFF) position.
2. Start up the personal computer.
3. Connect special tool MB991827 to special tool MB991824 and the personal computer.
4. Connect special tool MB991910 to special tool MB991824.
5. Connect special tool MB991910 to the data link connector.
6. Turn the power switch of special tool MB991824 to the "ON" position.

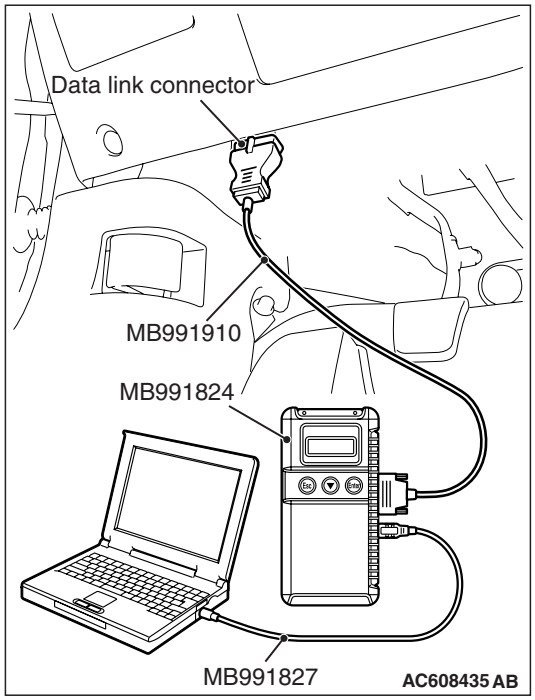
   NOTE: When the special tool MB991824 is energized, special tool MB991824 indicator light will be illuminated in a green color.
7. Start the M.U.T.-III system on the personal computer.

   NOTE: Disconnecting the scan tool MB991958 is the reverse of the connecting sequence, making sure that the ignition switch is at the "LOCK" (OFF) position.

HOW TO READ AND ERASE DIAGNOSTIC TROUBLE CODES.

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



⚠ CAUTION

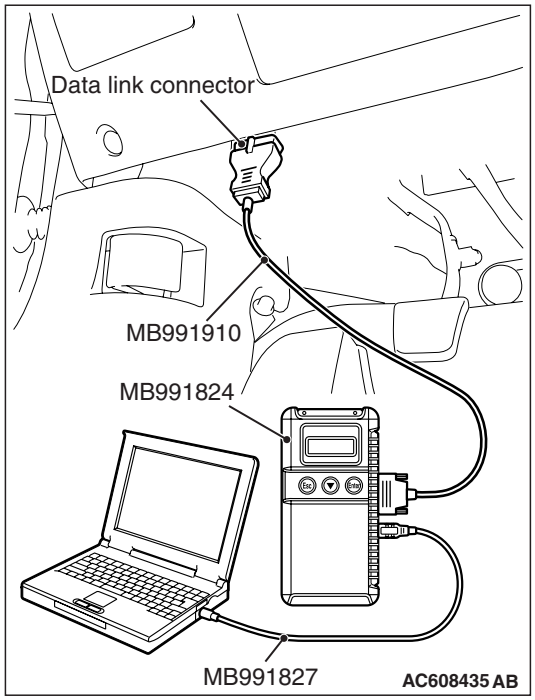
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Diagnostic Trouble Code"
8. If a DTC is set, it is shown.
9. Choose "Erase DTCs" to erase the DTC.

HOW TO READ DATA LIST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



⚠ CAUTION

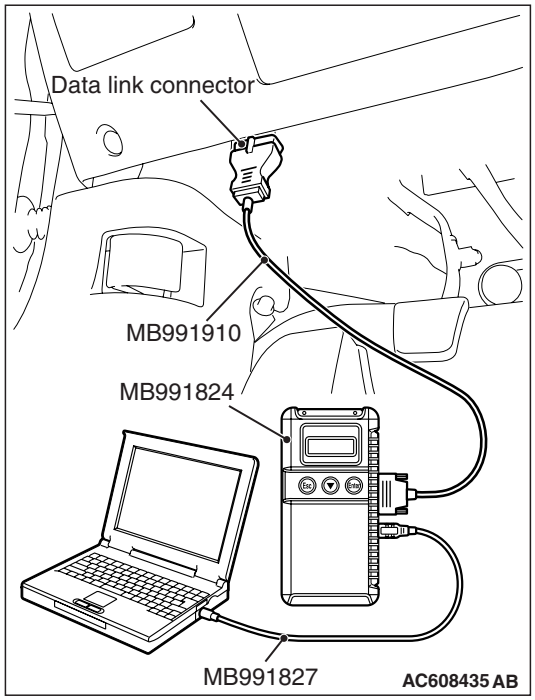
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Data List."
8. Choose an appropriate item and select the "OK" button.

HOW TO PERFORM ACTUATOR TEST

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



⚠ CAUTION

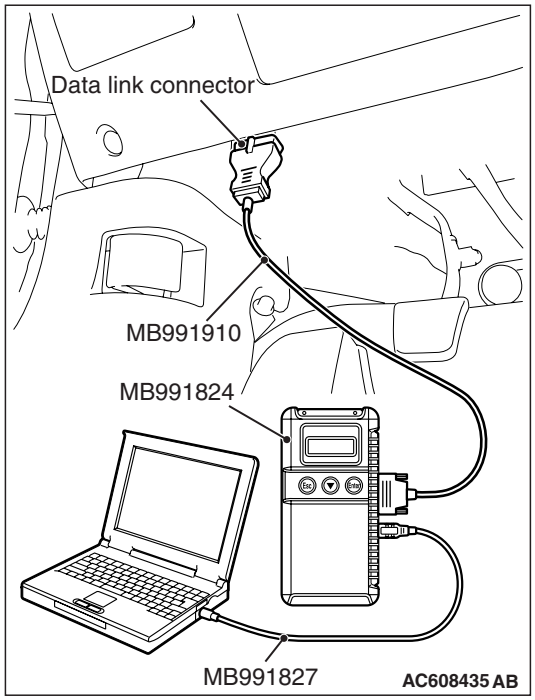
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "System select."
4. Choose "from 2006 MY" under "MODEL YEAR".
5. Check that "Vehicle Information" contents are correct.
6. Choose "MFI".
7. Select "Actuator Test."
8. Choose an appropriate item and select the "OK" button.

HOW TO DIAGNOSE THE CAN BUS LINES

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Select "CAN bus diagnosis" from the start-up screen.
4. When the vehicle information is displayed, confirm that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
5. Select the "view vehicle information" button.
6. Enter the vehicle information and select the "OK" button.
7. When the vehicle information is displayed, confirm again that it matches the vehicle whose CAN bus lines will be diagnosed.
   - If they matches, go to step 8.
   - If not, go to step 5.
8. Select the "OK" button.
9. When the optional equipment screen is displayed, choose the one which the vehicle is fitted with, and then select the "OK" button.

PROVISIONAL DTCs [OBD-II Test Mode - Results (Mode 7)]

The general scan tool will display the Provisional DTCs reported by ECM if the ECM detects some malfunction for "Misfire", "Fuel System" and "Comprehensive" monitoring during a SINGLE Driving Cycle. The intended use of this data is to assist the technician after a vehicle repair, and after clearing diagnostic information, by reporting test result after a SINGLE Driving Cycle. Note that the test results reported by this mode do not necessarily indicate a faulty component/system. If test results indicate a failure after ADDITIONAL (consecutive) driving, then the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will be illuminated and a DTC will set.

MODE 6 REFERENCE TABLE

The engine control module (ECM) monitors the condition of emission control system.

By selecting MODE 6 using scan tool, Test Result and Limit Value (minimum) *1 or (maximum) *2 about the main items of emission control system which ECM monitors can be confirmed. The value at the last monitoring is output by ECM as a test result.

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
01	81	Oxygen Sensor Monitor Bank 1 –Sensor 1 Rich/Lean Switching frequency	ECM monitors the deteriorated condition of the heated oxygen sensor (front) by checking the rich/lean switching frequency of the heated oxygen sensor (front).	× 1 count
02	82	Oxygen Sensor Monitor Bank 1 –Sensor 2 Output Voltage change	ECM checks the output voltage of the heated oxygen sensor (rear) in order to monitor whether the heated oxygen sensor (rear) output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 1 –Sensor 2 Rich To Lean Sensor Switch Time	ECM checks the rich to lean switching time of the heated oxygen sensor (rear) in order to monitor the response of the heated oxygen sensor (rear).	× 1 msec
	88	Oxygen Sensor Monitor Bank 1 –Sensor 2 Output Voltage drop slope	ECM checks the output voltage drop slope of the heated oxygen sensor (rear) in order to monitor the response of the heated oxygen sensor.	× 1 msec

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
03 <California>	82	Oxygen Sensor Monitor Bank 1 –Sensor 3 Output Voltage change	ECM checks the output voltage of the center exhaust pipe heated oxygen sensor in order to monitor whether the center exhaust pipe heated oxygen sensor output is stuck.	× 0.122 mV
	05	Oxygen Sensor Monitor Bank 1 –Sensor 3 Rich To Lean Sensor Switch Time	ECM checks the rich to lean switching time of the center exhaust pipe heated oxygen sensor in order to monitor the response of the center exhaust pipe heated oxygen sensor.	× 1 msec
	88	Oxygen Sensor Monitor Bank 1 –Sensor 3 Output Voltage change	ECM checks the output voltage drop slope of the center exhaust pipe heated oxygen sensor in order to monitor the response of the center exhaust pipe heated oxygen sensor.	× 1 msec
21	83	Catalyst Monitor Bank 1 Frequency ratio between Front- and Rear-Oxygen Sensors	ECM monitors the deterioration of catalyst by the output frequency ratio between heated oxygen sensor (front) and heated oxygen sensor (rear).	× 0.0039
31 <California>	84	EGR Monitor Difference of manifold pressure before and after EGR activation	ECM monitors the operation of EGR system by the pressure difference of intake manifold between before and after introduction of EGR using the manifold absolute pressure sensor.	× 0.0117 kPa
39	85	EVAP Monitor (Cap off) Pressure drop during de-pressurizing	ECM monitors the leak of fuel evaporation gas by checking whether the pressure can be reduced (the amount of pressure reduction) using the fuel tank differential pressure sensor after sealing the fuel tank and the fuel line.	× 0.0117 kPa

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
3B	85	EVAP Monitor (0.040") Pressure rise during airtight condition	After ECM vacuumizes the fuel tank and the fuel line and then the specified time is passed, ECM monitors the leak of fuel evaporation gas through the fuel tank differential pressure sensor to check the reduction of vacuum in the fuel tank.	× 0.0117 kPa
3C	85	EVAP Monitor (0.020") Pressure rise during airtight condition	After ECM vacuumizes the fuel tank and the fuel line and then the specified time is passed, ECM monitors the leak of fuel evaporation gas through the fuel tank differential pressure sensor to check the reduction of vacuum in the fuel tank.	× 0.0117 kPa
A1	0B	Mis-Fire General Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire General Data Misfire Counts For Last/Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A2	0B	Mis-Fire Cylinder 1 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 1 Data Misfire Counts For Last/Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count

ON-BOARD DIAGNOSTIC MONITOR ID	STANDARDIZED / MANUFACTURER DEFIND TEST ID	MONITORING ITEM	SIMPLE TECHNICAL DESCRIPTION	CONVERSION COEFFICIENT IN USING GENERAL SCAN TOOL
A3	0B	Mis-Fire Cylinder 2 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 2 Data Misfire Counts For Last/Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A4	0B	Mis-Fire Cylinder 3 Data EWMA Misfire Counts For Last 10 Driving Cycles.	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 3 Data Misfire Counts For Last/Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
A5	0B	Mis-Fire Cylinder 4 Data EWMA Misfire Counts For Last 10 Driving Cycles	ECM monitors angular acceleration of crankshaft and detect misfire. EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles.	× 1 count
	0C	Mis-Fire Cylinder 4 Data Misfire Counts For Last/Current Driving Cycle	ECM monitors angular acceleration of crankshaft and detect misfire. Misfire counts for last/current driving cycle.	× 1 count
E1 <California>	87	HC Adsorber Monitor Bank 1 Response time delay between Rear- and 3rd-Oxygen Sensors <Applicable to SULEV model>	During forced rich control, time difference is monitored between two points: from when heated oxygen sensor (rear) is switched to "rich" to when center exhaust pipe heated oxygen sensor is switched to "rich".	× 1 msec

*NOTE: *1: Minimum value: The test fails if test value is less than this value.*

*NOTE: *2: Maximum value: The test fails if test value is greater than this value.*

NOTE: When not finishing the monitor of the driving cycle for the request of On-Board Monitoring Test Request, the ECM outputs the stored latest monitor test result.

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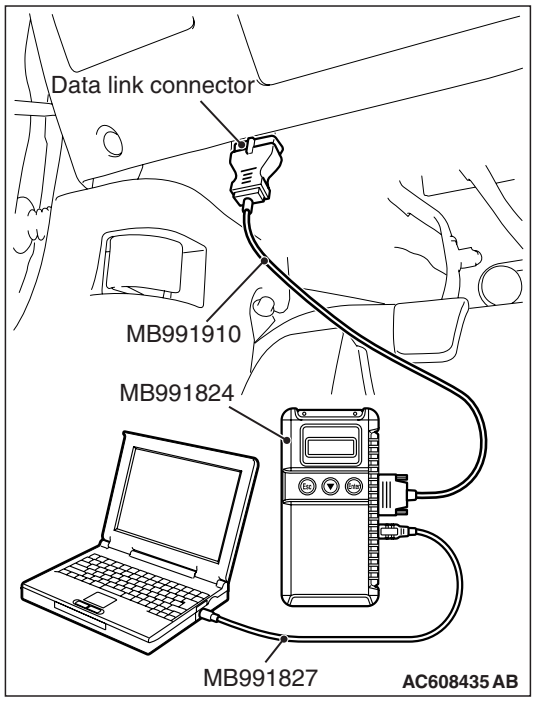
NOTE: When the monitored test results are erased by the battery disconnection and so on, the ECM outputs the values in hexadecimal of "0000" or "FFFF", otherwise it outputs abnormal values and so on. In case of this, the ECU outputs are handled as invalid-values. When the first monitor (Readiness Status) is completed after this, the ECM outputs the valid-values.

NOTE: "Test Limit Type & Component ID byte" output from the ECM is given in hexadecimal of "00" or "80". "00" means the maximum value and "80" means the minimum value.

DIAGNOSTIC BY DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

NOTE: When mode II is selected with MB991958, the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) will light when the engine control module (ECM) first detects the trouble (Note that this is only for emission-related trouble). At the same time, the relevant diagnostic trouble codes will be registered. In respect to the comprehensive component electrical faults (opens/shorts), the time for the diagnostic trouble code to be registered after the fault occurrence is four seconds →one second. Therefore, the confirmation of the trouble symptom and the confirmation after completing repairs can be reduced. To return to the normal mode I after mode II has been selected once, the ignition switch must be turned "OFF" once or mode I must be reselected with the scan tool MB991958. The diagnostic trouble code, system readiness test status and freeze frame data, etc., will be erased when mode I is returned to, so record these before returning to mode I.

1. Connect scan tool MB991958 to the data link connector.
2. Turn the ignition switch to the "ON" position.
3. Change the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY).
4. Road test the vehicle.
5. Read the diagnostic trouble code and repair the malfunctioning part.
6. Turn the ignition switch to the "LOCK" (OFF) position.
7. Disconnect scan tool MB991958 from the data link connector.

ON-BOARD DIAGNOSTICS

The engine control module (ECM) monitors the input/output signals (some signals all the time and others under specified conditions) of the ECM. When a malfunction continues for a specified time or longer after the irregular signal is initially monitored, the ECM judges that a malfunction has occurred. After the ECM first detects a malfunction, a diagnostic trouble code is recorded when the engine is restarted and the same malfunction is re-detected. However, for items marked with a "*", a diagnostic trouble code is recorded on the first detection of the malfunction. There are 136 diagnostic items. The diagnostic results can be read out with a scan tool. Since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the ECM connector is disconnected. In addition, the diagnostic trouble code can also be erased by turning the ignition switch to ON and sending the diagnostic trouble code erase signal from scan tool MB991958 to the ECM.

NOTE: If the sensor connector is disconnected with the ignition switch turned on, the diagnostic trouble code is memorized. In this case, send the diagnostic trouble code erase signal to the ECM in order to erase the diagnostic memory. The 136 diagnostic items are all indicated sequentially from the smallest code number. The ECM records the engine operating condition when the diagnostic trouble code is set. This data is called "Freeze-frame" data. This data can be read by using the scan tool, and can then be used in simulation tests for troubleshooting. Data items are as follows:

NOTE: If the ECM detects multiple malfunctions, the ECM stores the "Freeze-frame" data for only the first item that was detected. However, if the ECM detects a misfire or a fuel system malfunction, the ECM stores the data by giving priority to the misfire or fuel system malfunction, regardless of the order in which the malfunction was detected.

NOTE: As for Diagnostic trouble code P1603, "Freeze-frame" data is not memorized.

Freeze Frame Data for M.U.T.-III

ITEM NO.	M.U.T.-III SCAN TOOL DISPLAY	DATA ITEM	UNIT or STATE
AA	Airflow sensor	Airflow sensor	g/s
AB	TP sensor (main)	Throttle position sensor (main)	%
BA <California>	Target EGR	Target EGR steppper motor	%
BB	Barometric pressure sensor	Barometric pressure sensor	kPa or inHg
BC	Relative TP sensor	Relative throttle position sensor	%
BD	TP sensor(sub)	Throttle position sensor (sub)	%
BE	APP sensor(main)	Accelerator pedal position sensor (main)	%
BF	APP sensor(sub)	Accelerator pedal position sensor (sub)	%
C0	Fuel system status (bank1)	Fuel system status	• Open loop
			• Closed loop
			• Open loop-drive condition
			• Open loop-DTC set
			• Closed loop-O2 (rear) failed
C2	Calculated load value	Calculated load value	%
C3	ECT sensor	Engine coolant temperature sensor	°C or °F
C4	Short term fuel trim (bank1)	Short term fuel trim	%
C5*	Short term fuel trim(bank3)	Short term fuel trim (bank3)	%
C6	Long term fuel trim (bank1)	Long term fuel trim	%
C7*	Long term fuel trim (bank3)	Long term fuel trim (bank3)	%
CC	MAP sensor	Manifold absolute pressure sensor	kPa or inHg
CD	Crankshaft position sensor	Crankshaft position sensor	r/m
CE	Vehicle speed	Vehicle speed	km/h or mph
CF	Spark advance	Spark advance	deg
D0	Intake air temperature sensor	Intake air temperature sensor	°C or °F
D1	Time since engine running	Time since engine running	sec
D6	EVAP. emission purge SOL. duty	Evaporative emission purge control solenoid duty	%
D7	Fuel level gauge	Fuel level gauge	%
D8	Power supply voltage	Power supply voltage	V
D9	Absolute load value	Absolute load value	%
DA	Target equivalence ratio	Target equivalence ratio	
DB	Intake air temperature sensor	Intake air temperature sensor	°F
DC	Throttle actuator	Throttle actuator control motor	%

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*NOTE: *: Data items are displayed on M.U.T.- Ⅲ display, but the in-line 4 engine is not applicable and its data is displayed as "*****".*

Freeze Frame Data for General Scan Tool

COMMON EXAMPLE of GENERAL SCAN TOOL DISPLAY	PRAMETER IDENTIFICATION (PID)	DESCRIPTION	UNIT or STATE
DTCFRZF	02	DTC that caused required freeze frame data storage	Pxxxx, Uxxxx
FUELSYS 1	03	See M.U.T.-III Item No. C0	
LOAD_PCT	04	See M.U.T.-III Item No. C2	
ECT	05	See M.U.T.-III Item No. C3	
SHRTFT 1	06	See M.U.T.-III Item No. C4	
LONGFT 1	07	See M.U.T.-III Item No. C6	
MAP	0B	See M.U.T.-III Item No. CC	
RPM	0C	See M.U.T.-III Item No. CD	
VSS	0D	See M.U.T.-III Item No. CE	
SPARKADV	0E	See M.U.T.-III Item No. CF	
IAT	0F	See M.U.T.-III Item No. D0	
MAF	10	See M.U.T.-III Item No. AA	
TP	11	See M.U.T.-III Item No. AB	
RUNTM	1F	See M.U.T.-III Item No. D1	
EGR_PCT <California>	2C	See M.U.T.-III Item No. BA	
EVAP_PCT	2E	See M.U.T.-III Item No. D6	
FLI	2F	See M.U.T.-III Item No. D7	
BARO	33	See M.U.T.-III Item No. BB	
VPWR	42	Control module voltage	V
LOAD_ABS	43	Absolute Load Value	%
EQ_RAT	44	Commanded Equivalence Ratio	%
TP_R	45	Relative Throttle Position	%
AAT	46	Ambient air temperature	°C (°F)
TP_B	47	Absolute Throttle Position B	%
APP_D	49	Accelerator pedal position D	%
APP_E	4A	Accelerator pedal position E	%
TAC_PCT	4C	Command Throttle Actuator Control	%

OBD- II DRIVE CYCLE

All kinds of diagnostic trouble codes (DTCs) can be monitored by carrying out a short drive according to the following 23 drive cycle patterns. In other words, doing such a drive regenerates any kind of trouble which involves illuminating the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and verifies the repair procedure has been eliminated [the trouble the Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) is no longer illuminated].

⚠ CAUTION

Two technicians should always be in the vehicle when carrying out a test.

NOTE: Check that the diagnosis trouble code (DTC) is not output before driving the OBD-II drive cycle. Erase the DTC if it has been output.

NOTE: Drive cycle patterns are not established for Vehicle speed sensor monitor (DTC P0500), Power steering pressure switch monitor (P0551), and Fuel level sensor monitor (DTC P0461, P2066). Please reference the M.U.T. data list to judge whether these monitor items are normal.

DRIVE CYCLE PATTERN LIST

MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Heated oxygen sensor (front) monitor <Readiness test item>	P0133	1
Heated oxygen sensor heater monitor <Readiness test item>	P0031, P0032, P0037, P0038, P0043, P0044	2
Exhaust gas recirculation (EGR) system monitor <Readiness test item>	P0401, P0489, P0490	3
Catalytic converter monitor <Readiness test item>	P0421	4
Evaporative emission system leak monitor (small leak and gross leak) <Readiness test item>	P0442, P0455	5
Evaporative purge system monitor	P0441	
Fuel tank pressure sensor monitor	P0450	
Evaporative emission system leak monitor (very small leak) <Readiness test item>	P0456	6
Airflow sensor monitor	P0101	7
Manifold absolute pressure (MAP) sensor monitor	P0106, P0107	
Intake air temperature sensor monitor	P0111	8
Engine coolant temperature sensor monitor	P0116, P0125	9
Thermostat monitor	P0128	10
Heated oxygen sensor (rear) monitor <Readiness test item>	P0139	11
Heated oxygen sensor (3rd) monitor <Readiness test item>	P0145	
HC adsorber (HC trap catalyst) monitor	P2423	
Air fuel ratio feedback monitor	P0134	12
Heated oxygen sensor (rear) monitor	P0140	13
Heated oxygen sensor (3rd) monitor	P0146	
Fuel tank temperature sensor monitor	P0181	14
Misfire monitor	P0300, P0301, P0302, P0303, P0304	15
Fuel tank pressure sensor monitor	P0451	16

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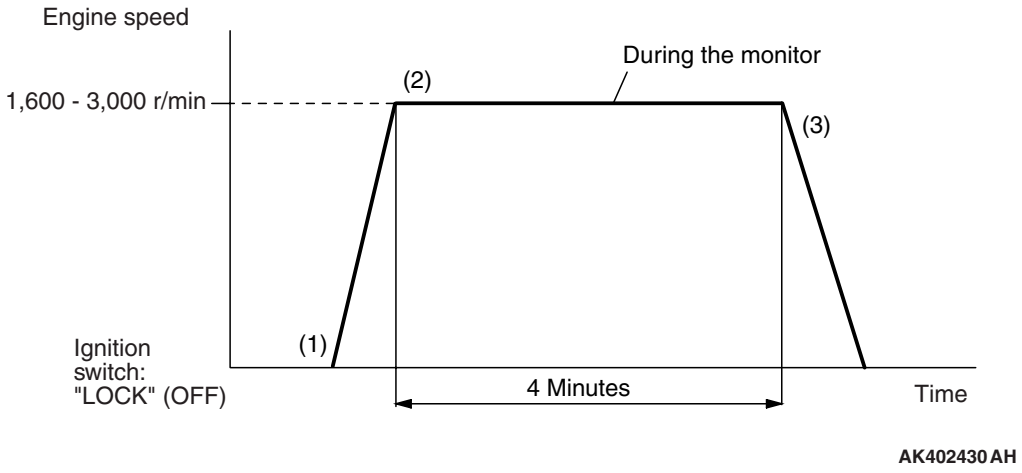
MONITOR ITEM	DIAGNOSTIC TROUBLE CODE (DTC)	PATTERN
Power steering pressure switch monitor	P0554	17
Throttle position sensor plausibility monitor	P1233, P1234	
Mass airflow sensor plausibility monitor	P1235, P1238	
Torque monitor	P1241	
Idle speed control system monitor	P0506, P0507	18
Idle speed control system monitor	P1506, P1507	19
Ignition timing retard control (cold start strategy) monitor	P1320	
Variable valve timing system (MIVEC) monitor	P0011, P0014, P0016, P0017, P1021, P1025	20
Fuel trim monitor	P0171, P0172	21
Heated oxygen sensor monitor	P0131, P0137, P0143, P2195	22
Airflow sensor monitor	P0102, P0103	23
Manifold absolute pressure (MAP) sensor monitor	P0108	
Intake air temperature sensor monitor	P0112, P0113	
Engine coolant temperature sensor monitor	P0117, P0118	
Heated oxygen sensor monitor	P0132, P0138, P0144, P2252, P2253	
Fuel tank temperature sensor monitor	P0182, P0183	
Injector monitor	P0201, P0202, P0203, P0204	
Crankshaft position sensor monitor	P0335	
Camshaft position sensor monitor	P0340, P0365	
Evaporative emission purge solenoid monitor	P0443	
Evaporative emission ventilation solenoid monitor	P0446	
Fuel tank pressure sensor monitor	P0452, P0453	
Fuel level sensor monitor	P0462, P0463	
Engine oil control valve monitor	P1021, P1025	
Engine RPM plausibility monitor	P1239	
Barometric pressure sensor monitor	P2228, P2229	

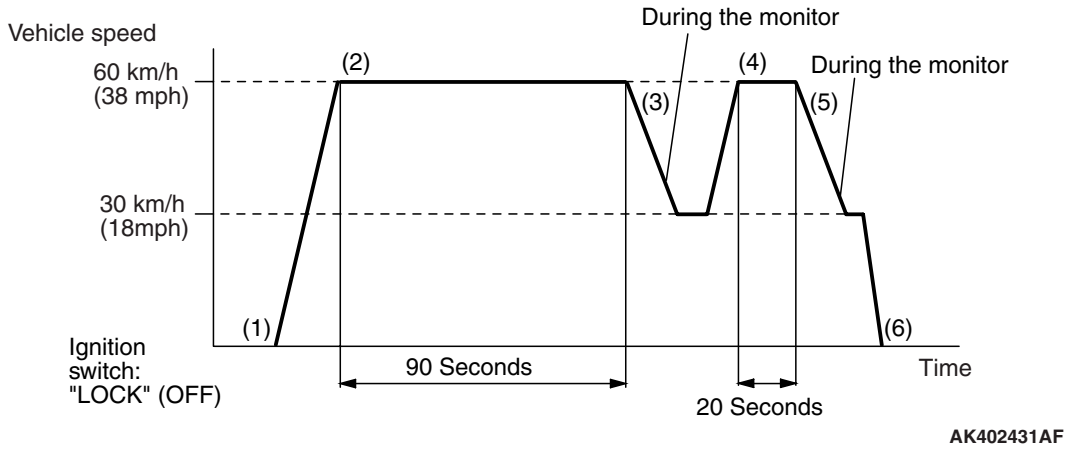
PATTERN 1

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82° C (180° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 4 minutes at the following conditions. (During the monitor) *NOTE: When the system is normal, the monitor is completed earlier.* • Vehicle speed: More than 30 km/h (19 mph) • Engine speed: More than 1,600 r/min, less than 3,000 r/min • Engine load: More than 20 %, less than 60 % • Without rapid accelerator pedal movement 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

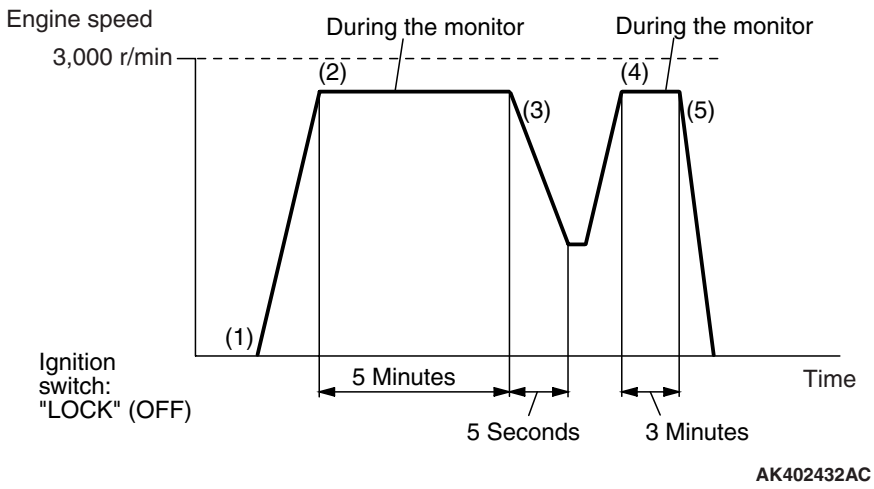
PATTERN 2

Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 10 seconds. (During the monitor) 3. Turn the ignition switch to the "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

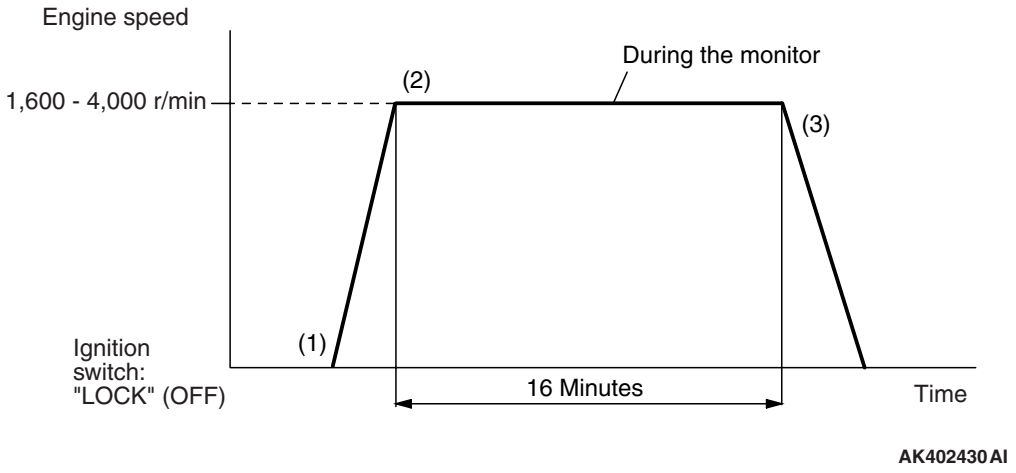
PATTERN 3

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82° C (180° F) • Intake air temperature: More than 5° C (41° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is 60 km/h (38 mph) and then drive the vehicle for 90 seconds. 3. Release the accelerator pedal and reduce vehicle speed to 30 km/h (18 mph). (During the monitor) 4. Accelerate until the vehicle speed is 60 km/h (38 mph) and then drive the vehicle for 20 seconds. 5. Release the accelerator pedal and reduce vehicle speed to 30 km/h (18 mph). (During the monitor) 6. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 7. Start the engine and do Steps 1 to 6 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 8. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 4

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 30° C (86° F) • Intake air temperature: More than −10° C (14° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all accessories switched OFF. 2. Drive the vehicle for 5 minutes at the following conditions. (During the monitor) • Engine speed: Less than 3,000 r/min • Airflow rate: More than 13 g/sec, less than 45 g/sec • Accelerator pedal: Except full close • Without rapid accelerator pedal movement 3. Release the accelerator pedal for 5 seconds. 4. Drive the vehicle for 3 minutes at the following conditions. (During the monitor) • Engine speed: Less than 3,000 r/min • Airflow rate: More than 13 g/sec, less than 45 g/sec • Accelerator pedal: Except full close • Without rapid accelerator pedal movement *NOTE: When the system is normal, the monitor is completed earlier.* 5. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Start the engine and do Steps 1 to 5 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 7. Confirm that the diagnostic trouble code (DTC) is not output.

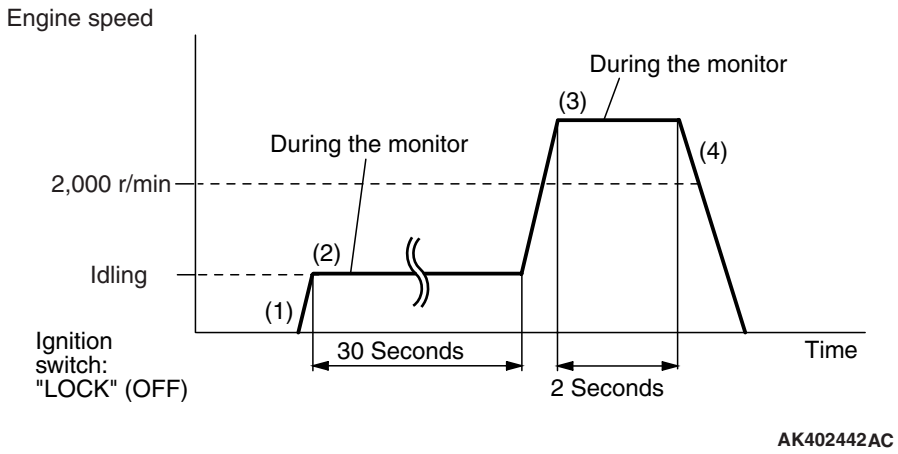
PATTERN 5

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: Less than 36° C (96° F) • Intake air temperature at engine start: Less than 36° C (96° F) • Fuel amount at engine start: More than 15 %, less than 40 % • Engine coolant temperature: More than 60° C (41° F) • Intake air temperature: More than 5° C (41° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Fuel temperature: Less than 36° C (96° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 16 minutes at the following conditions. (During the monitor) • Engine speed: More than 1,600 r/min, less than 4,000 r/min • Vehicle speed: More than 30 km/h (18.7 mph) • Engine load: More than 20 %, less than 70 % • Without rapid accelerator pedal movement *NOTE: Keep running as long as possible with the power steering pressure switch in the OFF position.* *NOTE: When the system is normal, the monitor is completed earlier.* 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

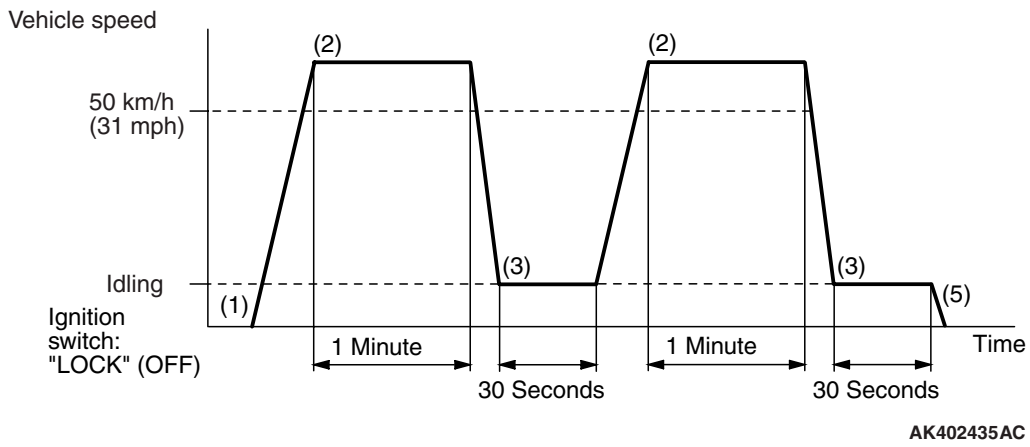
PATTERN 6

Inspection conditions	• Engine coolant temperature at engine start: Less than 36° C (96° F) • Intake air temperature at engine start: Less than 36° C (96° F) • Fuel amount at engine start: More than 40 %, less than 85 % • Engine coolant temperature: More than 20° C (68° F) • Intake air temperature: More than 5° C (41° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Fuel temperature: Less than 32° C (90° F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 16 minutes. (During the monitor) *NOTE: When the system is normal, the monitor is completed earlier.* 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. *NOTE: When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. The second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle.* 5. Confirm that the diagnostic trouble code (DTC) is not output.

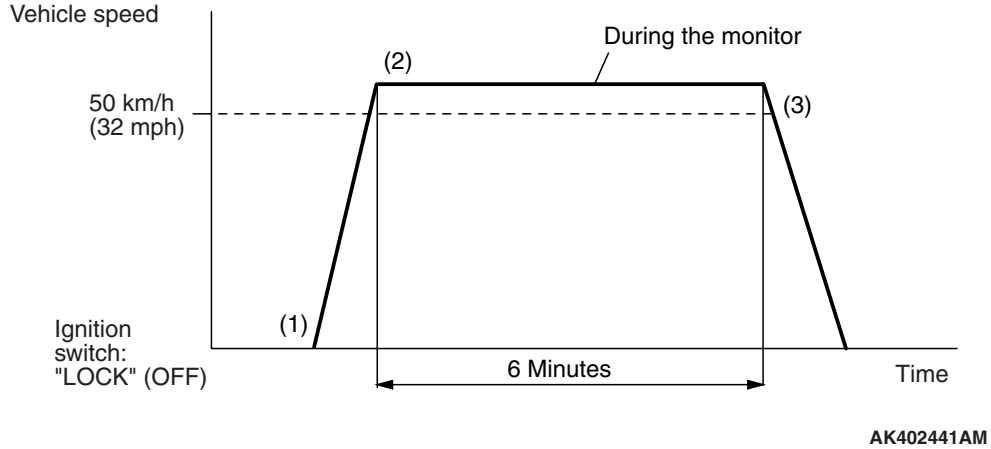
PATTERN 7

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 0° C (32° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 30 seconds. (During the monitor) 3. Accelerate the vehicle for 2 seconds at the following conditions. (During the monitor) • Engine speed: More than 2,000 r/min • Engine load: More than 60 % • Throttle position sensor output voltage: More than 3.5 volts 4. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 8

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76° C (169° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 1 minute. 3. Stop the vehicle in a safe place and let the engine idle for 30 seconds. 4. Repeat Steps 2 and 3 again. 5. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 9

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 7° C (47° F) • Intake air temperature: Less than 60° C (140° F) • Engine coolant temperature: More than 40° C (104° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 6 minutes at the following condition. (During the monitor) • Vehicle speed: More than 50 km/h (32 mph) • Except fuel cut 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Confirm that the diagnostic trouble code (DTC) is not output.

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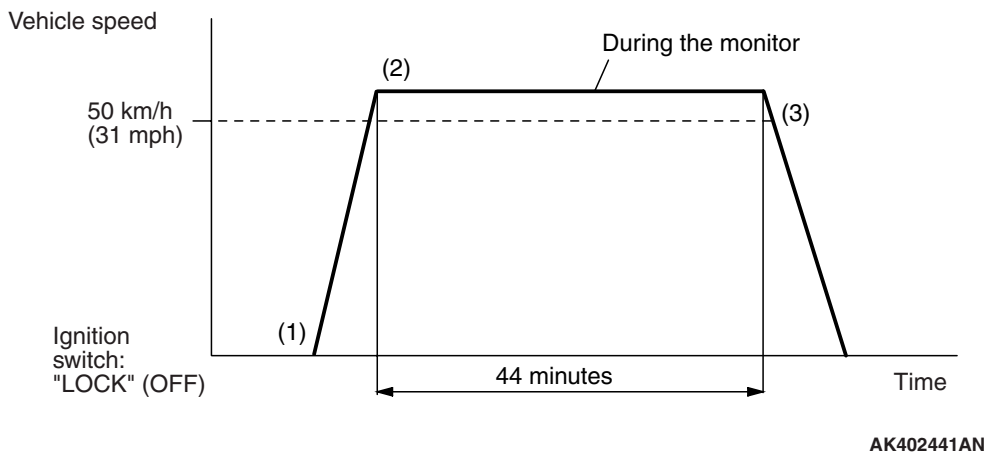
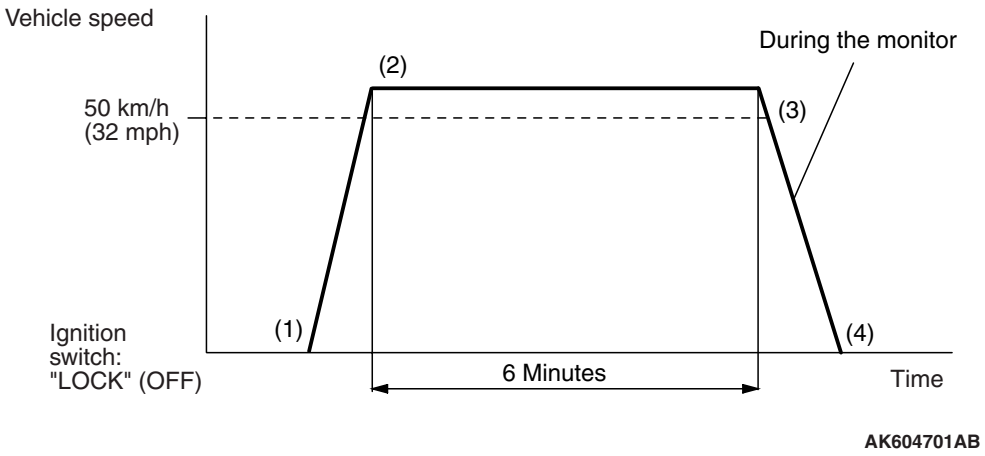
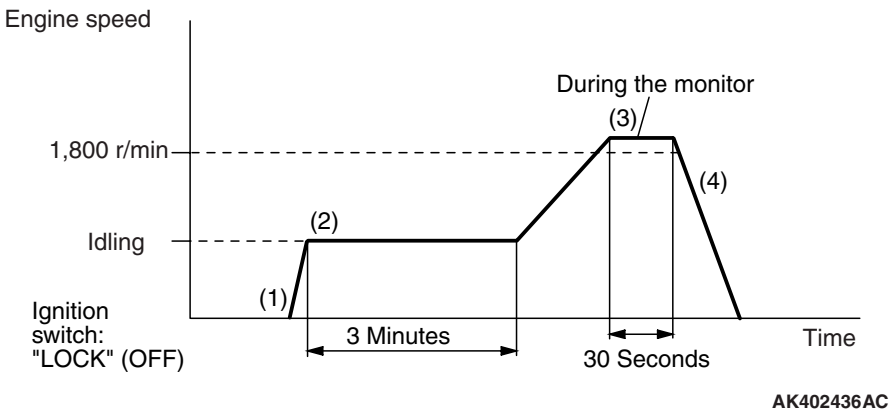
PATTERN 10

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature at engine start: More than 10° C (50° F), less than 76° C (168° F) • Intake air temperature at engine start: More than 10° C (14° F) • Dropping of intake air temperature since engine start: Less than 5° C (9° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 20 minutes at the following conditions. (During the monitor) • Vehicle speed: More than 50 km/h (32 mph) • Except fuel cut *NOTE: The system is normal if engine coolant temperature will rise more than 82°C (180°F) within 44 minutes.* 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

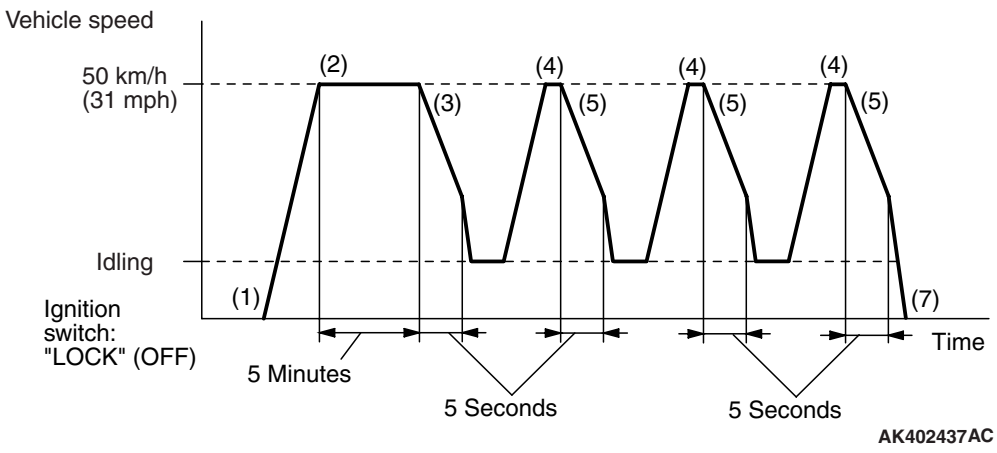
PATTERN 11

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76° C (169° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 6 minutes. 3. Release the accelerator pedal for 10 seconds then stop the vehicle in a safe place. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 12

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 82° C (180° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 3 minutes. 3. Drive the vehicle for 30 seconds at the following conditions. (During the monitor) • Engine speed: More than 1,800 r/min • Engine load: More than 30 %, less than 80 % • Throttle position sensor output: Less than 3.0 volts • Except fuel cut 4. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 5. Confirm that the diagnostic trouble code (DTC) is not output.

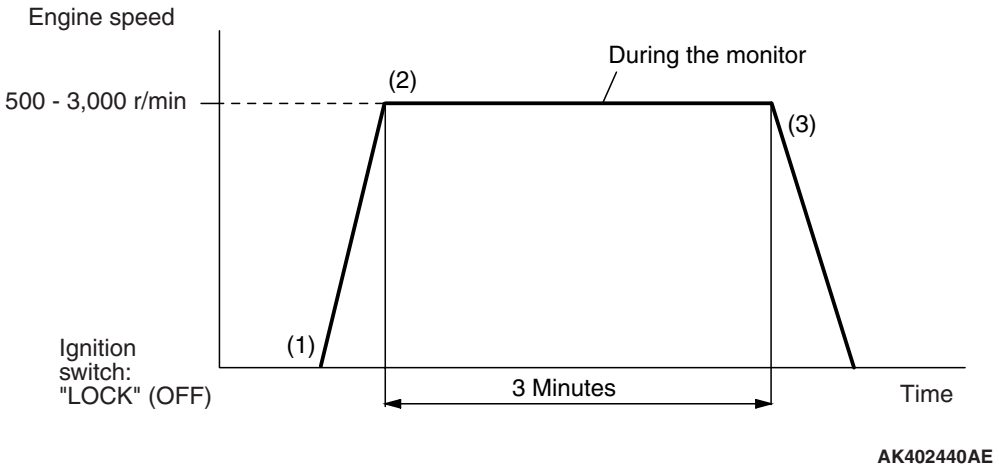
PATTERN 13

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 76° C (169° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at 50 km/h (31 mph) for 5 minutes. 3. Release the accelerator pedal for 5 seconds then stop the safe place. 4. Accelerate until the vehicle speed is at 50 km/h (31 mph) at the following conditions. • Engine speed: More than 1,500 r/min • Engine load: More than 40 % 5. Release the accelerator pedal for 5 seconds then stop the safe place. 6. Repeat Steps 4 and 5 for 2 times. 7. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 8. Start the engine and do Steps 1 to 7 again. 9. Confirm that the diagnostic trouble code (DTC) is not output.

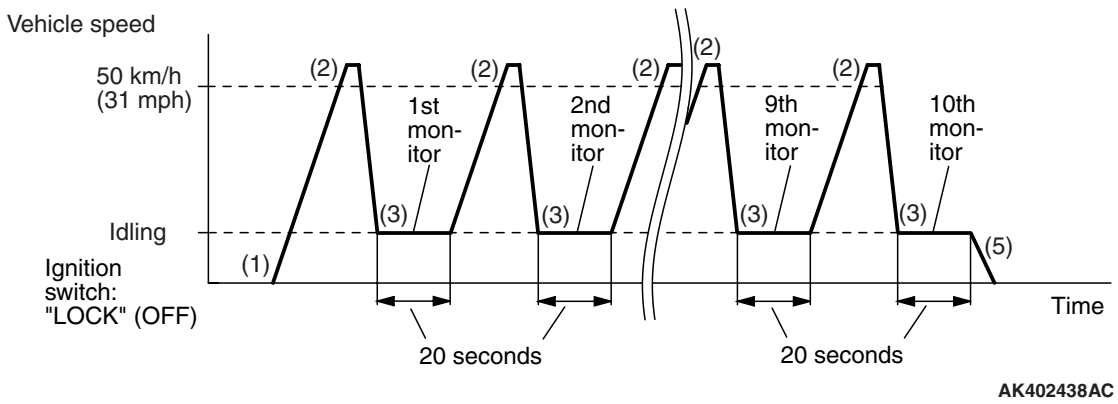
PATTERN 14

Inspection conditions	• Engine coolant temperature at engine start: More than −10° C (14° F), less than 33° C (91° F) • Difference between engine coolant temperature and intake air temperature at engine start: Less than 5° C (9° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 30 km/h (19 mph) until engine coolant temperature rises more than 60° C (140° F). (During the monitor) 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 15

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than −10° C (14° F) • Intake air temperature: More than −10° C (14° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle for 3 minutes at the following conditions. (During the monitor) • Engine speed: More than 500 r/min, less than 3,000 r/min • Engine load: More than 25 % • Without rapid accelerator pedal change • Except fuel cut 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 16

Drive cycle pattern	
Inspection condition	Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is more than 50 km/h (31 mph). • Engine speed: More than 2,500 r/min • Engine load: More than 55 % 3. Stop the vehicle in a safe place and let the engine idle for 20 seconds. (During the monitor) 4. Repeat Steps 2 and 3 for 10 times. 5. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 6. Start the engine and do Steps 1 to 5 again. 7. Confirm that the diagnostic trouble code (DTC) is not output.

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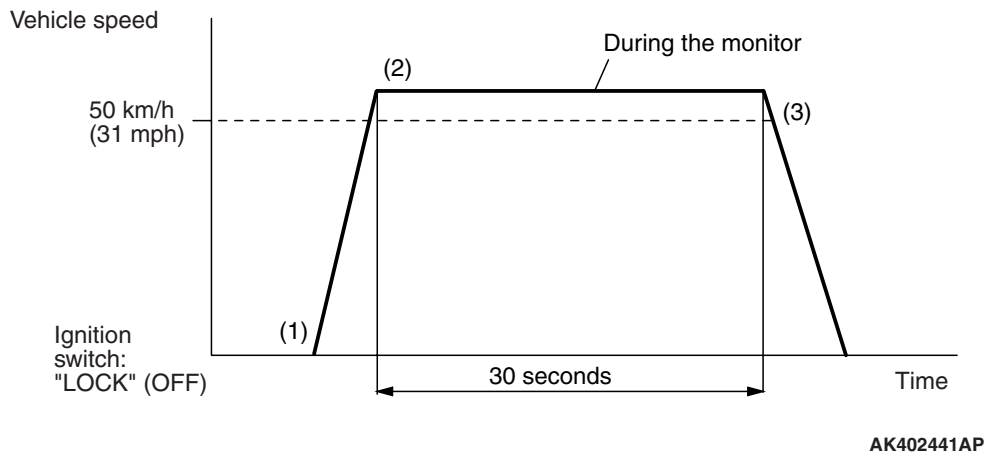
PATTERN 17

Drive cycle pattern	
Inspection conditions	• Engine coolant temperature: More than 30° C (86° F) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the vehicle at more than 50 km/h (31 mph) for 30 seconds. (During the monitor) 3. Stop the vehicle in a safe place and turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 18

Inspection conditions	• Engine coolant temperature: More than 82° C (180° F) • Intake air temperature: More than –10° C (14° F) • Barometric pressure: More than 76 kPa (22.5 inHg) • Condition of CVT: Selector lever "D" range
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Accelerate until the vehicle speed is more than 1.5 km/h (1 mph). 3. Stop the vehicle in a safe place and let the engine idle for 1 minute. (During the monitor) 4. Turn the ignition switch to "LOCK" (OFF) position. 5. Start the engine and do Steps 1 to 4 again. 6. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 19

Inspection conditions	• Engine coolant temperature: More than 7° C (45° F), less than 40° C (104° F) • Intake air temperature: More than –10° C (14° F) • Barometric pressure: More than 76 kPa (22.5 inHg)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 1 minute. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 20

Inspection conditions	• Engine coolant temperature: More than 77° C (171° F), less than 87° C (189° F) • Barometric pressure: More than 76 kPa (22.5 inHg)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Drive the engine at 1,200 –1,500 r/min for 30 seconds. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 21

Inspection condition	Engine coolant temperature: More than 82° C (180° F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 15 minutes. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 22

Inspection conditions	• Intake air temperature: More than –10° C (14° F) • Engine coolant temperature sensor: More than 7° C (45° F)
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle for 4 minutes. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Start the engine and do Steps 1 to 3 again. 5. Confirm that the diagnostic trouble code (DTC) is not output.

PATTERN 23

Inspection conditions	• Fuel temperature sensor: Less than 36° C (96° F) <Fuel tank pressure sensor monitor> • Fuel amount at engine start: Less than 85 % <Fuel tank pressure sensor monitor>
Test procedure	1. Start the engine with all the accessories switched OFF. 2. Let the engine idle at the engine speed less than 1,000 r/min for 15 seconds. (During the monitor) 3. Turn the ignition switch to "LOCK" (OFF) position. 4. Confirm that the diagnostic trouble code (DTC) is not output.

SYSTEM READINESS TEST STATUS

PURPOSE

The Readiness function (also referred to as I/M Readiness or I/M Flags) indicates if a full diagnostic check has been "Completed" (is "Ready") for each non-continuous monitor. Enhanced I/M State Emission Programs will use the Readiness status (Codes) to see if the vehicle is ready for OBD-II testing. "Incomplete" (Not Ready) codes will be one of the triggers for I/M failure.

OVERVIEW

The ECM monitors the following main diagnosis items and records whether the evaluation was completed or is incomplete. The Readiness Codes are established for the I/M programs, thereby confirming that the vehicles have not been tampered with by erasing the diagnostic trouble code(s) (DTCs) before I/M testing. The Readiness Codes and DTCs can be reset by disconnecting the battery or by erasing the codes with a scan tool MB991958 (M.U.T.-III sub assembly). For this reason, all the Readiness Codes must be displayed "Complete" before I/M testing.

When the monitors run and complete, the scan tool MB991958 (M.U.T.-III sub assembly) will display the Readiness Codes as "Complete" (General Scan Tools display as "Ready"). When the vehicle is operating normally and the OBD-II Drive Cycle is carried out, the Readiness Codes will be set as "Complete" on the first drive cycle. For DTCs requiring two drive cycles to detect a fault, the second drive cycle is required to set the Readiness Codes as "Complete" if a fault is detected during the first drive cycle. If the fault is still there after the second drive cycle, a DTC will be set.

- Catalyst: P0420, P0421
- Evaporative system: P0442, P0455, P0456
- Heated oxygen sensor: P0133, P0139, P0145
- Heated oxygen sensor heater: P0031, P0032, P0037, P0038, P0043, P0044
- EGR system: P0401

After all the Readiness Codes are displayed as "Complete", the technician is assured that any DTCs related to the monitor will be displayed if the system has a problem. That is why some State's I/M programs require the Readiness Code as "Complete" before they check for DTCs.

NOTE: After a repair is made for a DTC, the technician should drive the OBD-II Drive Cycle checking that the scan tool MB991958 (M.U.T.-III Sub Assembly) displays all the Readiness Codes as "Complete".

FAIL-SAFE FUNCTION REFERENCE TABLE

M1131153000794

When the main sensor malfunctions are detected by the diagnostic test mode, the vehicle is controlled by means of the following defaults.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Mass airflow sensor	• Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping.
Intake air temperature sensor	Controls as if the intake air temperature is 25° C (77° F).
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80° C (176° F). (This control will be continued until the ignition switch is turned to "LOCK" (OFF) position even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to "ON" position, the No.1 cylinder top dead center is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (30 in.Hg).
Knock sensor	Switches the ignition timing from ignition timing for high octane to ignition timing for standard octane fuel.
Heated oxygen sensor <front>	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor <rear>	Performs the closed loop control of the air/fuel ratio by using only the signal of the heated oxygen sensor (front) installed on the front side of the catalytic converter.
Generator FR terminal	No generator output suppression control is performed for the electrical load (to be operated as an ordinary generator).
Misfire detection	The ECM stops supplying fuel to the cylinder with the highest misfire rate if a misfire that could damage the catalytic converter is detected.
Accelerator pedal position sensor (main)	• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (sub) signal, but rendering it only as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (sub) is also malfunctioning.
Accelerator pedal position sensor (sub)	• Detects the amount of the accelerator pedal travel through the use of the accelerator pedal position sensor (main) signal, but rendering it only as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the accelerator pedal position sensor (main) is also malfunctioning.

MALFUNCTION ITEM	CONTROL CONTENTS DURING MALFUNCTION
Throttle position sensor (main)	• Controls the throttle valve position through the use of the throttle position sensor (sub) signal. • Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle. • Prohibits the operation of the engine speed feedback control. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (sub) is also malfunctioning.
Throttle position sensor (sub)	• Controls the throttle valve position through the use of the throttle position sensor (main) signal. • Renders the amount of accelerator pedal travel as being approximately one-half the normal opening angle. • Prohibits the operation of the auto-cruise control. • Cuts off fuel when the engine speed exceeds 3,000 r/min. • Prohibits the idle speed control from learning. • Suppresses the engine output by stopping the electronically controlled throttle valve system if the throttle position sensor (main) is also malfunctioning.
Throttle valve position feedback	• Suppresses the engine output by stopping the electronically controlled throttle valve system. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control.
Throttle actuator control motor	• Suppresses the engine output by stopping the electronically controlled throttle valve system. • Prohibits the operation of the auto-cruise control. • Prohibits the operation of the engine speed feedback control.
Engine oil control valve	Does not control variable valve timing (V. V. T.).

DIAGNOSTIC TROUBLE CODE CHART

M1131151002664

⚠ CAUTION

During diagnosis, a DTC code associated with other system may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC(s). If DTC(s) are set, erase them all.

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0011	Intake variable valve timing system target error	P.13A-55
P0014	Exhaust variable valve timing system target error	P.13A-58
P0016	Crankshaft/camshaft (intake) position sensor phase problem	P.13A-61
P0017	Crankshaft/camshaft (exhaust) position sensor phase problem	P.13A-66
P0031	Heated oxygen sensor (front) heater circuit low <Except for California>	P.13A-71
	Heated oxygen sensor (front) heater circuit low <California>	P.13A-78
P0032	Heated oxygen sensor (front) heater circuit high <Except for California>	P.13A-85
	Heated oxygen sensor (front) heater circuit high <California>	P.13A-89

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DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0037	Heated oxygen sensor (rear) heater circuit low <Except for California>	P.13A-93
	Heated oxygen sensor (rear) heater circuit low <California>	P.13A-100
P0038	Heated oxygen sensor (rear) heater circuit high <Except for California>	P.13A-107
	Heated oxygen sensor (rear) heater circuit high <California>	P.13A-111
P0043	Heated oxygen sensor (3rd) heater circuit low <California>	P.13A-115
P0044	Heated oxygen sensor (3rd) heater circuit high <California>	P.13A-122
P0069	Abnormal correlation between manifold absolute pressure sensor and barometric pressure sensor	P.13A-126
P0101*	Mass airflow circuit range/performance problem	P.13A-131
P0102*	Mass airflow circuit low input	P.13A-137
P0103*	Mass airflow circuit high input	P.13A-144
P0106	Manifold absolute pressure circuit range/performance problem	P.13A-149
P0107	Manifold absolute pressure circuit low input	P.13A-158
P0108	Manifold absolute pressure circuit high input	P.13A-166
P0111*	Intake air temperature circuit range/performance problem	P.13A-171
P0112*	Intake air temperature circuit low input	P.13A-177
P0113*	Intake air temperature circuit high input	P.13A-181
P0116*	Engine coolant temperature circuit range/performance problem	P.13A-187
P0117*	Engine coolant temperature circuit low input	P.13A-193
P0118*	Engine coolant temperature circuit high input	P.13A-198
P0122*	Throttle position sensor (main) circuit low input	P.13A-206
P0123*	Throttle position sensor (main) circuit high input	P.13A-213
P0125*	Insufficient coolant temperature for closed loop fuel control	P.13A-219
P0128	Coolant thermostat (coolant temperature below thermostat regulating temperature)	P.13A-227
P0131	Heated oxygen sensor (front) circuit low voltage <Except for California>	P.13A-229
	Heated oxygen sensor (front) circuit low voltage <California>	P.13A-237
P0132	Heated oxygen sensor (front) circuit high voltage <Except for California>	P.13A-245
	Heated oxygen sensor (front) circuit high voltage <California>	P.13A-249
P0133	Heated oxygen sensor (front) circuit slow response <Except for California>	P.13A-253
	Heated oxygen sensor (front) circuit slow response <California>	P.13A-258
P0134*	Heated oxygen sensor (front) circuit no activity detected <Except for California>	P.13A-263
	Heated oxygen sensor (front) circuit no activity detected <California>	P.13A-268
P0137	Heated oxygen sensor (rear) circuit low voltage <Except for California>	P.13A-274
	Heated oxygen sensor (rear) circuit low voltage <California>	P.13A-283

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0138	Heated oxygen sensor (rear) circuit high voltage <Except for California>	P.13A-292
	Heated oxygen sensor (rear) circuit high voltage <California>	P.13A-296
P0139	Heated oxygen sensor (rear) circuit slow response <Except for California>	P.13A-300
	Heated oxygen sensor (rear) circuit slow response <California>	P.13A-304
P0140	Heated oxygen sensor (rear) circuit no activity detected <Except for California>	P.13A-308
	Heated oxygen sensor (rear) circuit no activity detected <California>	P.13A-312
P0143	Heated oxygen sensor (3rd) circuit low voltage <California>	P.13A-316
P0144	Heated oxygen sensor (3rd) circuit high voltage <California>	P.13A-324
P0145	Heated oxygen sensor (3rd) circuit slow response <California>	P.13A-328
P0146	Heated oxygen sensor (3rd) circuit no activity detected <California>	P.13A-332
P0171	System too lean	P.13A-336
P0172	System too rich	P.13A-342
P0181	Fuel tank temperature sensor circuit range/performance	P.13A-348
P0182	Fuel tank temperature sensor circuit low input	P.13A-355
P0183	Fuel tank temperature sensor circuit high input	P.13A-360
P0201	Injector circuit-cylinder 1	P.13A-367
P0202	Injector circuit-cylinder 2	P.13A-377
P0203	Injector circuit-cylinder 3	P.13A-387
P0204	Injector circuit-cylinder 4	P.13A-397
P0222*	Throttle position sensor (sub) circuit low input	P.13A-407
P0223*	Throttle position sensor (sub) circuit high input	P.13A-413
P0300	Random/multiple cylinder misfire detected	P.13A-418
P0301	Cylinder 1 misfire detected	P.13A-424
P0302	Cylinder 2 misfire detected	P.13A-428
P0303	Cylinder 3 misfire detected	P.13A-431
P0304	Cylinder 4 misfire detected	P.13A-434
P0326	Knock sensor circuit performance	P.13A-438
P0327	Knock sensor circuit low	P.13A-442
P0328	Knock sensor circuit high	P.13A-446
P0335*	Crankshaft position sensor circuit	P.13A-449
P0340*	Intake camshaft position sensor circuit	P.13A-459
P0365*	Exhaust camshaft position sensor circuit	P.13A-467
P0401	Exhaust gas recirculation flow insufficient detected <California>	P.13A-476
P0420	Warm up catalyst efficiency below threshold <Except for California>	P.13A-479
P0421	Warm up catalyst efficiency below threshold <California>	P.13A-481

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P0441	Evaporative emission control system incorrect purge flow	P.13A-484
P0442	Evaporative emission control system leak detected (small leak)	P.13A-488
P0443	Evaporative emission control system purge control valve circuit	P.13A-500
P0446	Evaporative emission control system vent control circuit	P.13A-507
P0450	Evaporative emission control system pressure sensor malfunction	P.13A-514
P0451	Evaporative emission control system pressure sensor range/performance	P.13A-523
P0452	Evaporative emission control system pressure sensor low input	P.13A-532
P0453	Evaporative emission control system pressure sensor high input	P.13A-542
P0455	Evaporative emission control system leak detected (gross leak)	P.13A-549
P0456	Evaporative emission control system leak detected (very small leak)	P.13A-561
P0461	Fuel level sensor circuit range/performance	P.13A-573
P0462	Fuel level sensor circuit low input	P.13A-576
P0463	Fuel level sensor circuit high input	P.13A-579
P0489	EGR valve (stepper motor) circuit malfunction (ground short) <California>	P.13A-582
P0490	EGR valve (stepper motor) circuit malfunction (battery short) <California>	P.13A-590
P0500*	Vehicle speed sensor malfunction <M/T>	P.13A-595
P0506	Idle control system RPM lower than expected	P.13A-603
P0507	Idle control system RPM higher than expected	P.13A-606
P0513	Immobilizer malfunction	P.13A-609
P0551	Power steering pressure switch circuit range/performance	P.13A-611
P0554	Power steering pressure switch circuit intermittent	P.13A-618
P0603*	EEPROM malfunction	P.13A-622
P0606*	Engine control module main processor malfunction	P.13A-624
P0622	Generator FR terminal circuit malfunction	P.13A-626
P0630*	Vehicle Identification Number (VIN) malfunction	P.13A-631
P0638*	Throttle actuator control motor circuit range/ performance	P.13A-633
P0642*	Throttle position sensor power supply	P.13A-636
P0657*	Throttle actuator control motor relay circuit malfunction	P.13A-638
P1021	Intake engine oil control valve circuit	P.13A-646
P1025	Exhaust engine oil control valve circuit	P.13A-653
P1231	Active stability control plausibility	P.13A-660
P1232	Fail safe system	P.13A-661
P1233*	Throttle position sensor (main) plausibility	P.13A-662
P1234*	Throttle position sensor (sub) plausibility	P.13A-666
P1235*	Mass airflow sensor plausibility	P.13A-670
P1236*	A/D converter	P.13A-673

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DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
P1237*	Accelerator pedal position sensor plausibility	P.13A-674
P1238*	Mass airflow sensor plausibility (torque monitor)	P.13A-677
P1239*	Engine RPM plausibility	P.13A-681
P1240	Ignition angle	P.13A-683
P1241*	Torque monitor	P.13A-684
P1242	Fail safe control monitor	P.13A-688
P1243	Inquiry/response error	P.13A-690
P1244	RAM test for all area	P.13A-691
P1245	Cycle RAM test (engine)	P.13A-692
P1247	CVT plausibility <CVT>	P.13A-693
P1320	Ignition timing retard insufficient	P.13A-694
P1506	Idle control system RPM lower than expected at low temperature	P.13A-697
P1507	Idle control system RPM higher than expected at low temperature	P.13A-700
P1590*	TCM to ECM communication error in torque reduction request <CVT>	P.13A-703
P1603*	Battery backup circuit malfunction	P.13A-706
P1676*	Variant coding	P.13A-710
P2100*	Throttle actuator control motor circuit (open)	P.13A-713
P2101*	Throttle actuator control motor magneto malfunction	P.13A-718
P2122*	Accelerator pedal position sensor (main) circuit low input	P.13A-722
P2123*	Accelerator pedal position sensor (main) circuit high input	P.13A-728
P2127*	Accelerator pedal position sensor (sub) circuit low input	P.13A-733
P2128*	Accelerator pedal position sensor (sub) circuit high input	P.13A-739
P2135*	Throttle position sensor (main and sub) range/performance problem	P.13A-743
P2138*	Accelerator pedal position sensor (main and sub) range/performance problem	P.13A-749
P2195	Heated Oxygen Sensor (front) Inactive <Except for California>	P.13A-756
	Heated Oxygen Sensor (front) Inactive <California>	P.13A-759
P2228*	Barometric pressure circuit low input	P.13A-762
P2229*	Barometric pressure circuit high input	P.13A-764
P2252	Heated oxygen sensor offset circuit low voltage	P.13A-766
P2253	Heated oxygen sensor offset circuit high voltage	P.13A-768
P2423	HC adsorber (HC trap catalyst) efficiency below threshold <California>	P.13A-770
U0001	Bus off	P.13A-772
U0101*	CVT-ECU time-out <CVT>	P.13A-774
U0121	ABS-ECU time-out	P.13A-778

DTC	DIAGNOSTIC ITEM	REFERENCE PAGE
U0141*	ETACS-ECU time-out	P.13A-781
U0167	Immobilizer communication error	P.13A-785
U1180*	Combination meter time-out	P.13A-787

NOTE: Do not replace the engine control module (ECM) until a through terminal check reveals there are no short/open circuits.

NOTE: Check that the ECM ground circuit is normal before checking for the cause of the problem.

NOTE: After the ECM detects a malfunction, a diagnostic trouble code is recorded the next time the engine is started and the same malfunction is re-detected. However, for items marked with a "", the diagnostic trouble code is recorded on the first detection of the malfunction.*

NOTE: Sensor 1 indicates the sensor mounted at a position closest to the engine, and sensor 2 indicates the sensor mounted at the position second closest to the engine. Also, sensor 3 indicates the sensor mounted at the position third closest to the engine.

SYMPTOM CHART

M1131151502205

⚠ CAUTION

During diagnosis, a DTC associated with other systems may be set when the ignition switch is turned on with connector(s) disconnected. On completion, confirm all systems for DTC(s). If DTC(s) are set, erase them all.

⚠ CAUTION

Disconnecting the battery cables or removing the combination meter will erase the learned value of the fuel gauge. To recover the learned value, input a vehicle speed (by actually driving the vehicle or inputting a simulated vehicle speed), and stop the vehicle. This will complete the learning process.

NOTE: Check that the ECM ground circuit is normal before checking for the cause of the problem.

NOTE: When the racing (3,000 to 5,000 r/min or more) continues on the vehicle stopped with no load during the specified time or more, the increase in the engine speed might be limited. This comes from the engine protection and control functions and is not a malfunction.

TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Communication with scan tool is impossible	Communication with ECM only is not possible	1	P.13A-791
Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) and related parts	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) does not illuminate right after the ignition switch is turned to the "ON" position	2	P.13A-794
	The Malfunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp) remains illuminated and never goes out	3	P.13A-795
Starting	Cranks, won't start	4	P.13A-796
	Starts up and dies	5	P.13A-802
	Hard starting	6	P.13A-806

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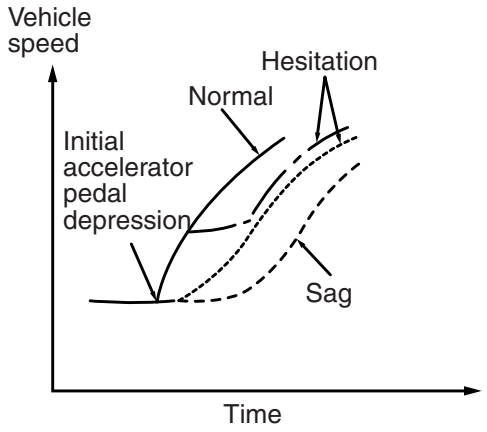
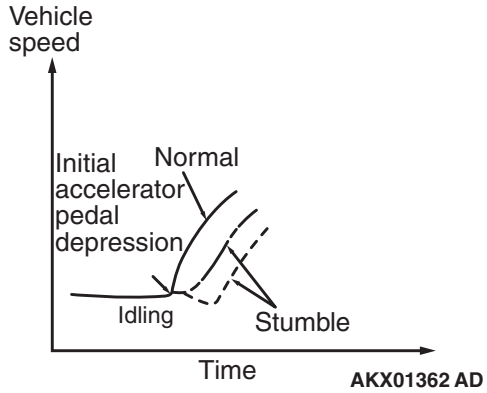
TROUBLE SYMPTOMS		INSPECTION PROCEDURE	REFERENCE PAGE
Idling stability (improper idling)	Unstable idle (rough idle, hunting)	7	P.13A-810
	Idle speed is high (improper idle speed)	8	P.13A-814
	Idle speed is low (improper idle speed)	9	P.13A-816
Idling stability (engine stalls)	When the engine is cold, it stalls at idle (die out)	10	P.13A-817
	When the engine is hot, it stalls at idle (die out)	11	P.13A-819
	The engine stalls when accelerating (pass out)	12	P.13A-822
	The engine stalls when decelerating	13	P.13A-824
Driving	Hesitation, sag, Stumble, Poor acceleration or Surge	14	P.13A-826
	Acceleration shock	15	P.13A-829
	Knocking	16	P.13A-831
Too high CO and HC concentration when idling		17	P.13A-832
IM240 test failure	Transient, mass emission tailpipe test failure	18	P.13A-835
	Purge flow test of the evaporative emission canister failure	19	P.13A-839
	Pressure test of the evaporative system failure	20	P.13A-840
Power supply system and ignition switch-IG system		21	P.13A-842
Fuel pump system		22	P.13A-848
Ignition switch-ST and starter relay system <M/T>		23	P.13A-854
Ignition switch-ST system and starter relay system <CVT>		24	P.13A-860
Ignition circuit system		25	P.13A-866
A/C system		26	P.13A-871
Engine oil pressure switch system		27	P.13A-874

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

ITEMS		SYMPTOM
At starting	Won't start	The starter cranks the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starts up and dies	The engine starts, but then engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc.
	Incorrect idle speed	The engine doesn't idle at the correct speed.
	Engine stall (die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (pass out)	The engine stalls when the accelerator pedal is depressed.

ITEMS		SYMPTOM	
At driving	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed). This occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag".	 AKX01361AC
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth. Also the inability to reach maximum speed.	
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration.	 AKX01362 AD
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.	
	Surge	This is slight acceleration and deceleration feel usually felt during steady, light throttle cruise. Most notable under light loads.	
	Knocking	A sharp sound during driving, which sounds like a hammer striking the cylinder walls. It makes poor driveability.	
At stopped	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to the "LOCK" (OFF) position. Also called "dieseling".	

DIAGNOSTIC TROUBLE CODE PROCEDURES

DTC P0011: Intake Variable Valve Timing System Target Error

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The phase angle of the intake camshaft is higher than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

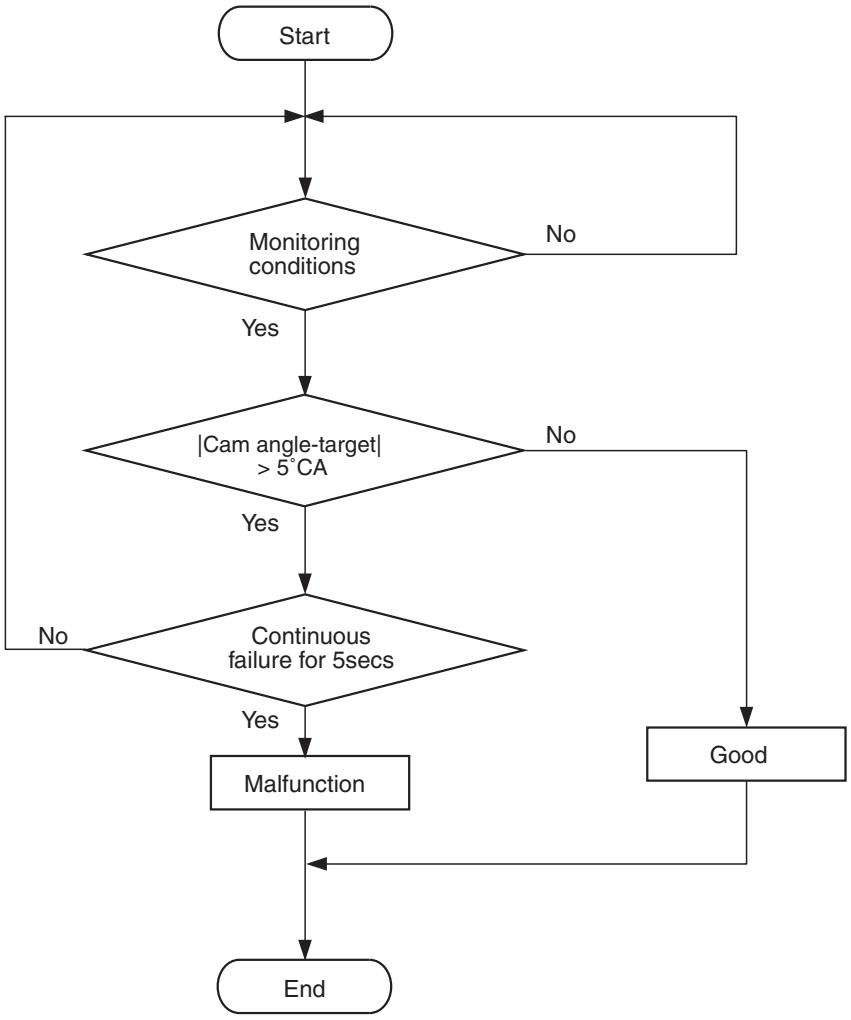
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 20 seconds have passed since the engine starting sequence was completed.
- Engine speed is 1,188 r/min or more.
- Engine coolant temperature is higher than 76° C (169° F).

Judgment Criterion

- The phase angle of the intake camshaft is 5 degrees or more for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake engine oil control valve failed.
- Oil passage of variable valve timing control system clogged.
- Intake variable valve timing sprocket operation mechanism stuck.
- ECM failed.

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DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

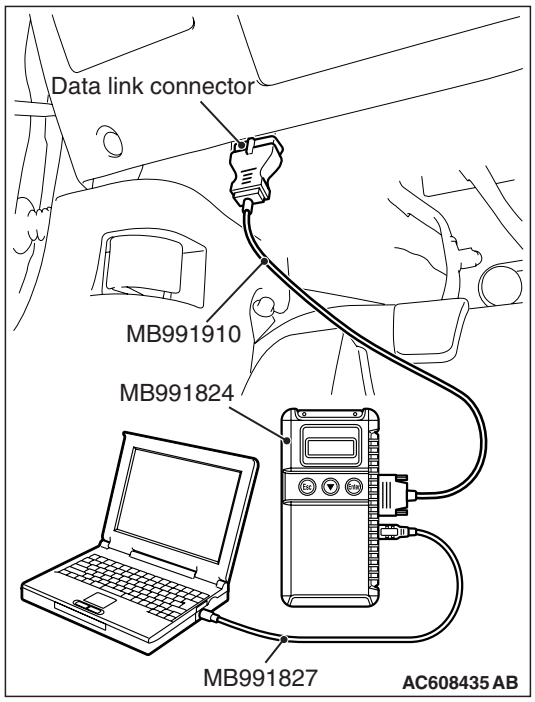
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0011 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check intake engine oil control valve itself.

- Check intake engine oil control valve itself (Refer to Engine Oil Control Valve Check P.13A-943).

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace intake engine oil control valve. Then go to Step 6.

STEP 3. Check oil passage of intake variable valve timing control system for being clogged.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair it. Then go to Step 6.

STEP 4. Check intake variable valve timing sprocket operation mechanism for being stuck.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

TSB Revision

STEP 5. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0011 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0011 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0014: Exhaust Variable Valve Timing System Target Error

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The phase angle of the exhaust camshaft is higher than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

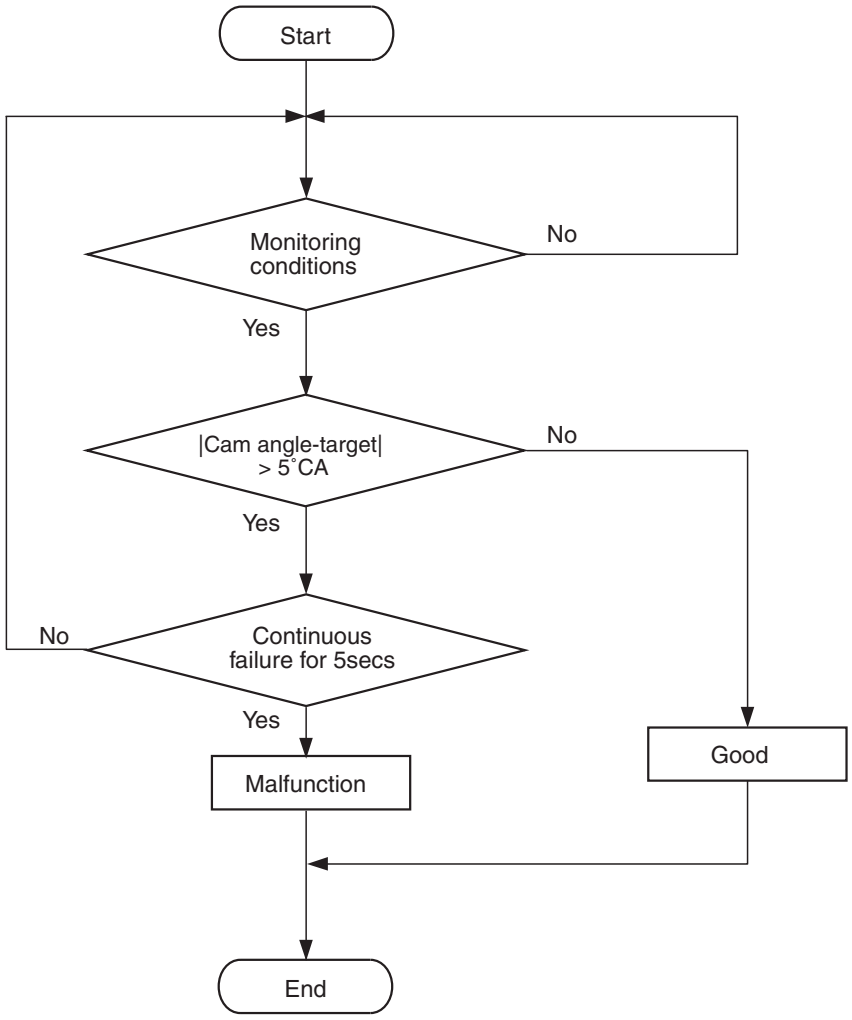
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 20 seconds have passed since the engine starting sequence was completed.
- Engine speed is 1,188 r/min or more.
- Engine coolant temperature is higher than 76° C (169° F).

Judgment Criterion

- The phase angle of the exhaust camshaft is 5 degrees or more for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Exhaust engine oil control valve failed.
- Oil passage of variable valve timing control system clogged.
- Exhaust variable valve timing sprocket operation mechanism stuck.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

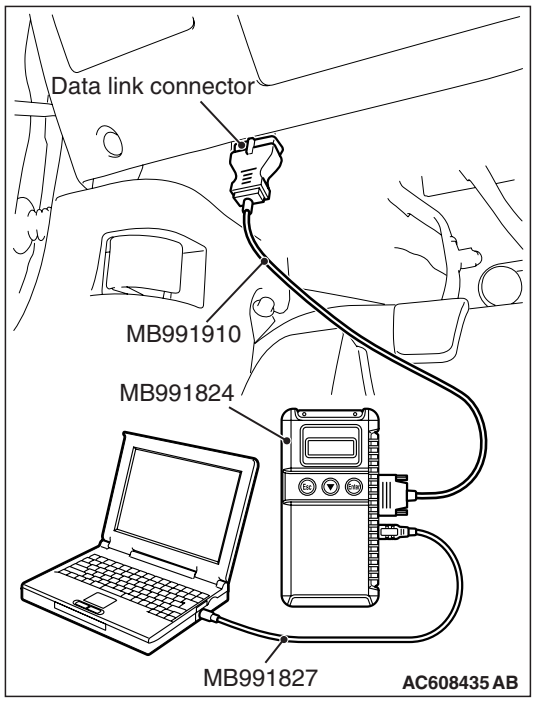
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the diagnostic trouble code other than P0014 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Check exhaust engine oil control valve itself.

- Check exhaust engine oil control valve itself (Refer to Engine Oil Control Valve Check P.13A-943).

Q: Is the check result normal?

YES : Go to Step 3.
NO : Replace exhaust engine oil control valve. Then go to Step 6.

STEP 3. Check oil passage of exhaust variable valve timing control system for being clogged.

Q: Is the check result normal?

YES : Go to Step 4.
NO : Repair it. Then go to Step 6.

STEP 4. Check exhaust variable valve timing sprocket operation mechanism for being stuck.

Q: Is the check result normal?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

TSB Revision

STEP 5. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0014 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 6. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0014 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0016: Crankshaft/camshaft (intake) Position Sensor Phase Problem

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The open timing of the intake valve is faster or slower than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

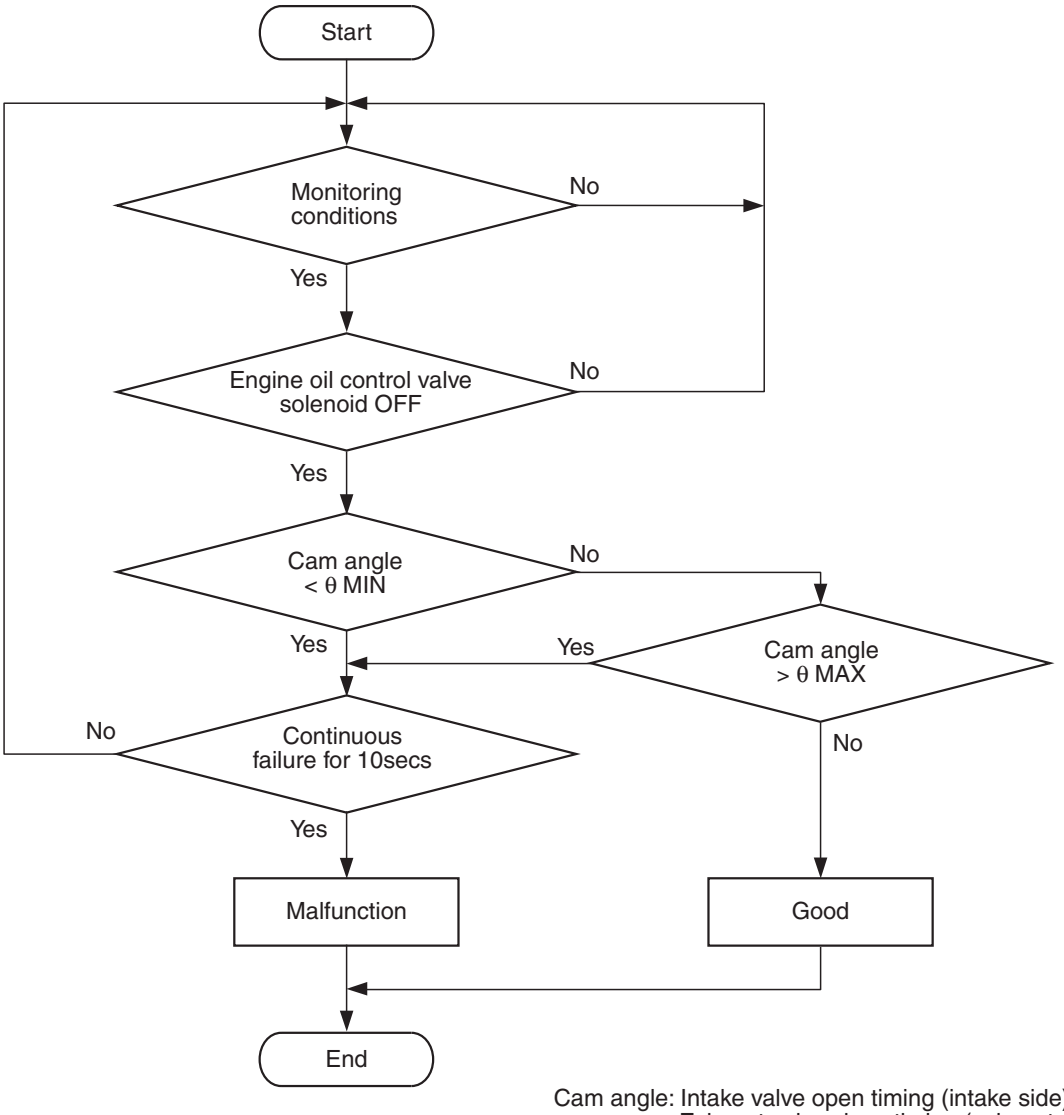
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Cam angle: Intake valve open timing (intake side)
Exhaust valve close timing (exhaust side)
θ MAX : Maximum threshold value
θ MIN : Minimum threshold value

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Check Conditions

- Engine speed is between 594 r/min and 1,500 r/min.
- Engine coolant temperature is between 20° C (68° F) and 88° C (190° F).
- Intake engine oil control valve is "OFF".
- 1 second has elapsed after the above mentions have been met.

Judgment Criterion

- The open timing of the intake valve is faster than −15 degrees (ATDC) <Except for California> or −18 degrees (ATDC) <California> for 10 seconds.

or

- The open timing of the intake valve is slower than 15 degrees (ATDC) <Except for California> or 12 degrees (ATDC) <California> for 10 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Timing chain in out of place.
- Loose timing chain.
- Intake variable valve timing sprocket tooth coming off.
- ECM failed.

DIAGNOSIS

Required Special Tools

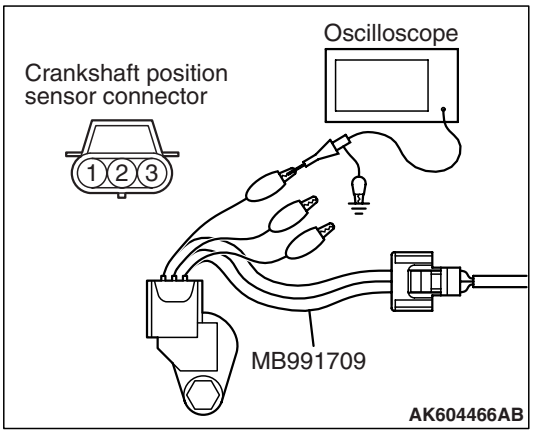
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using the oscilloscope, measure output wave pattern at crankshaft position sensor and intake camshaft position sensor.

(1) Disconnect the crankshaft position sensor connector B-105 and connect the test harness special tool (MB991709) between the separated connectors.

(2) Connect the oscilloscope probe to the crankshaft position sensor side connector terminal No. 3.

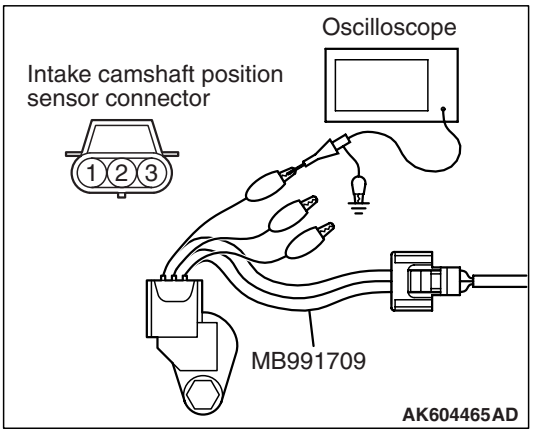
(3) Disconnect the intake camshaft position sensor connector B-106, and connect test harness special tool (MB991709) between the separated connectors.



(4) Connect the oscilloscope probe to the intake camshaft position sensor side connector terminal No. 3.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 8 (crankshaft position sensor) and terminal No. 14 (intake camshaft position sensor).

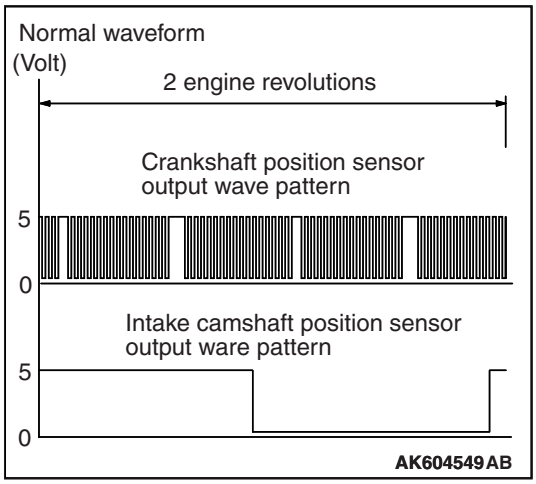
(5) Start the engine and run at idle.



(6) Check the waveform.

- The waveform should show a pattern similar to the illustration.

(7) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0016 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Check timing mark on the timing chain.

Q: Is timing chain in out of place?

YES : Repair it. Then go to Step 4.

NO : Check the following items, and repair or replace the defective items.

a. Check the timing chain loose.

b. Check the intake variable valve timing sprocket tooth coming off.

Then go to Step 4.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0016 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0017: Crankshaft/camshaft (exhaust) Position Sensor Phase Problem

TECHNICAL DESCRIPTION

- The ECM checks the variable valve timing system for malfunction.

DESCRIPTIONS OF MONITOR METHODS

The close timing of the exhaust valve is faster or slower than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

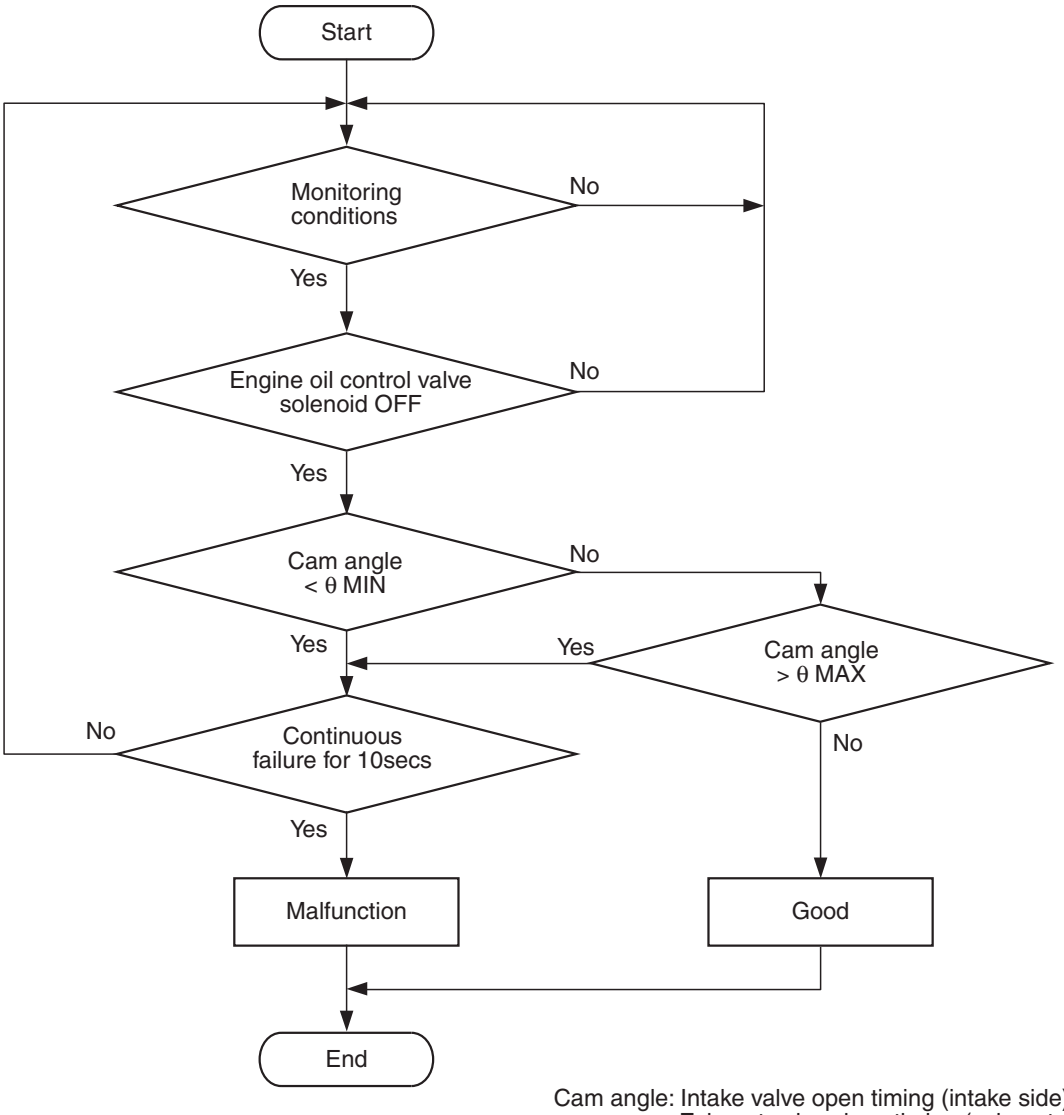
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



Cam angle: Intake valve open timing (intake side)
Exhaust valve close timing (exhaust side)
θ MAX : Maximum threshold value
θ MIN : Minimum threshold value

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Check Conditions

- Engine speed is between 594 r/min and 1,500 r/min.
- Engine coolant temperature is between 20° C (68° F) and 88° C (190° F).
- Exhaust engine oil control valve is "OFF".
- 1 second has elapsed after the above mentions have been met.

Judgment Criterion

- The close timing of the exhaust valve is faster than –15 degrees (ATDC) <Except for California> or –12 degrees (ATDC) <California> for 10 seconds.

or

- The close timing of the exhaust valve is slower than 15 degrees (ATDC) <Except for California> or 18 degrees (ATDC) <California> for 10 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 20 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Timing chain in out of place.
- Loose timing chain.
- Exhaust variable valve timing sprocket tooth coming off.
- ECM failed.

DIAGNOSIS

Required Special Tools

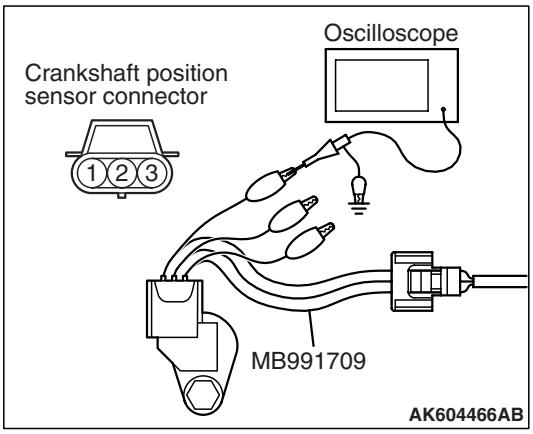
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using the oscilloscope, measure output wave pattern at crankshaft position sensor and exhaust camshaft position sensor.

(1) Disconnect the crankshaft position sensor connector B-105 and connect the test harness special tool (MB991709) between the separated connectors.

(2) Connect the oscilloscope probe to the crankshaft position sensor side connector terminal No. 3.

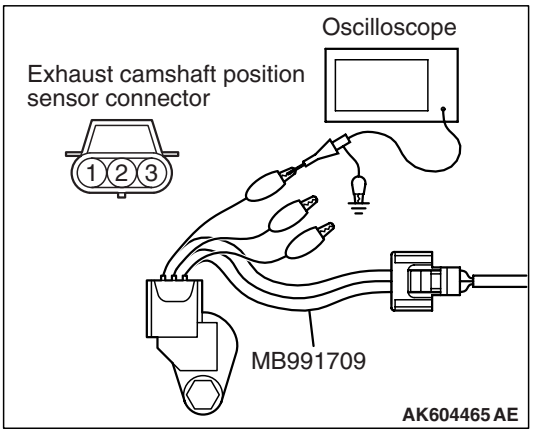
(3) Disconnect the exhaust camshaft position sensor connector B-107, and connect test harness special tool (MB991709) between the separated connectors.



(4) Connect the oscilloscope probe to the exhaust camshaft position sensor side connector terminal No. 3.

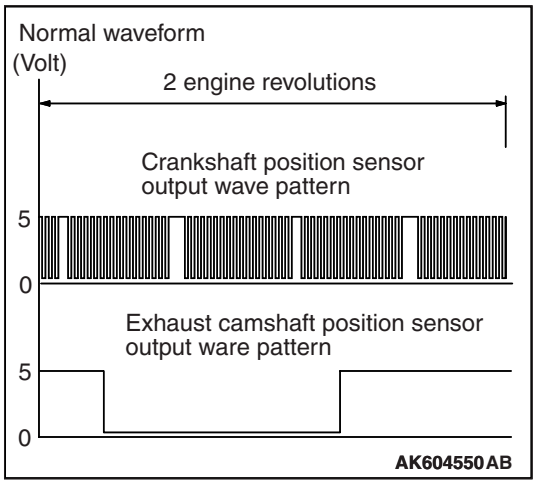
NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 8 (crankshaft position sensor) and terminal No. 7 (exhaust camshaft position sensor).

(5) Start the engine and run at idle.



(6) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(7) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0017 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/ Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Check timing mark on the timing chain.

Q: Is timing chain in out of place?

YES : Repair it. Then go to Step 4.

NO : Check the following items, and repair or replace the defective items.

a. Check the timing chain loose.

b. Check the exhaust variable valve timing sprocket tooth coming off.

Then go to Step 4.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 20 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

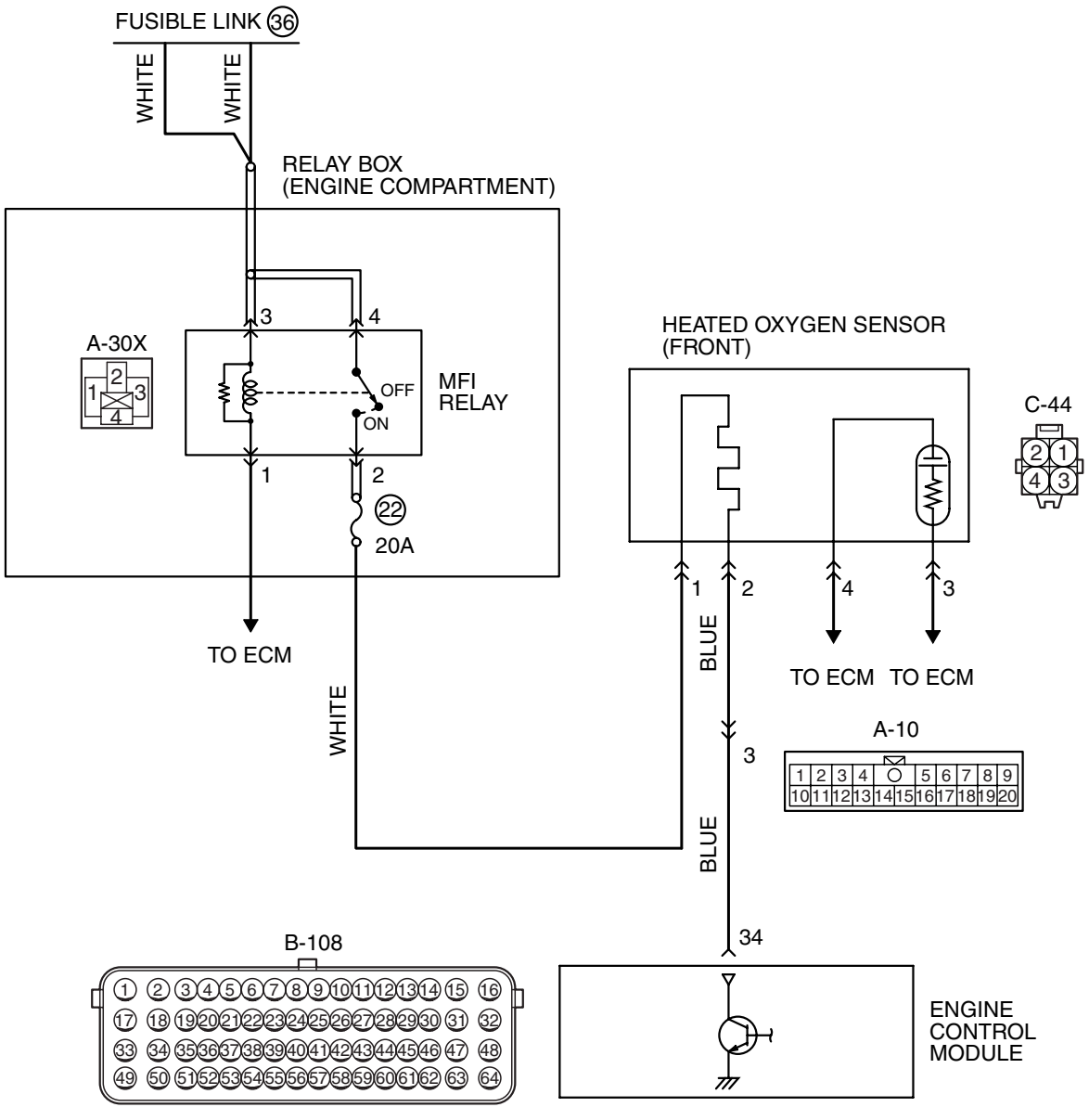
Q: Is DTC P0017 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0031: Heated Oxygen Sensor (front) Heater Control Circuit Low <Except for Calfornia>

HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT <EXCEPT FOR CALIFORNIA>



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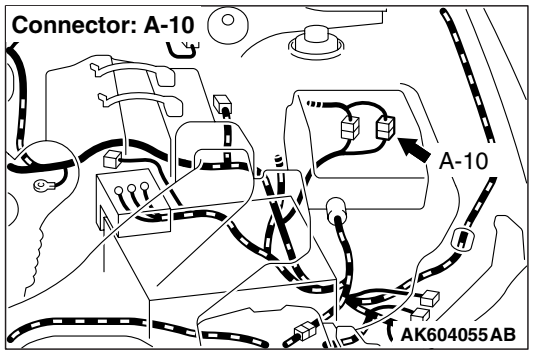
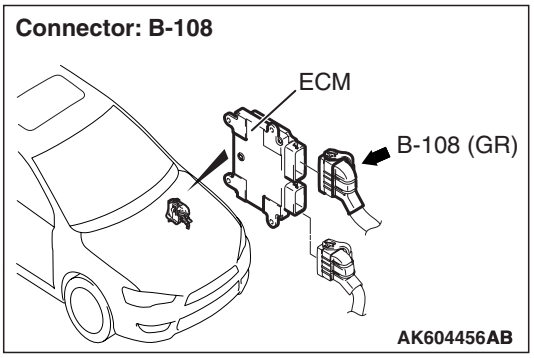
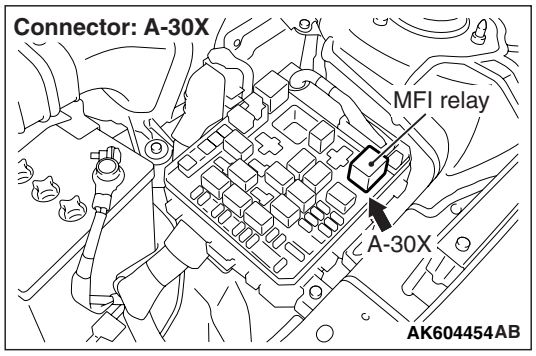
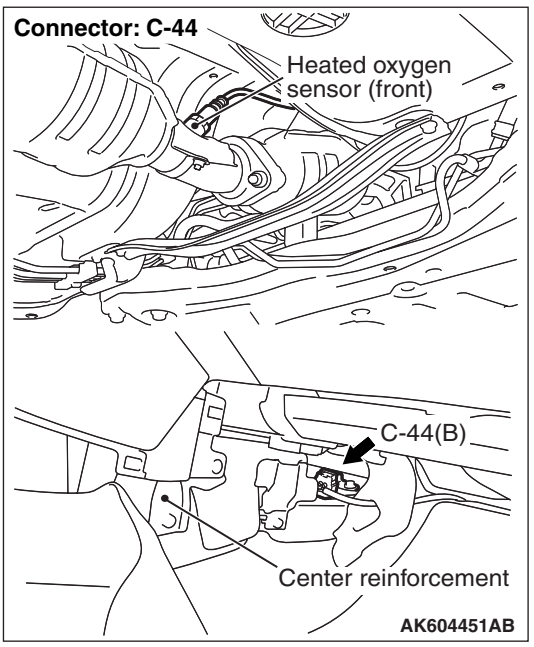








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.
- The ECM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (front) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

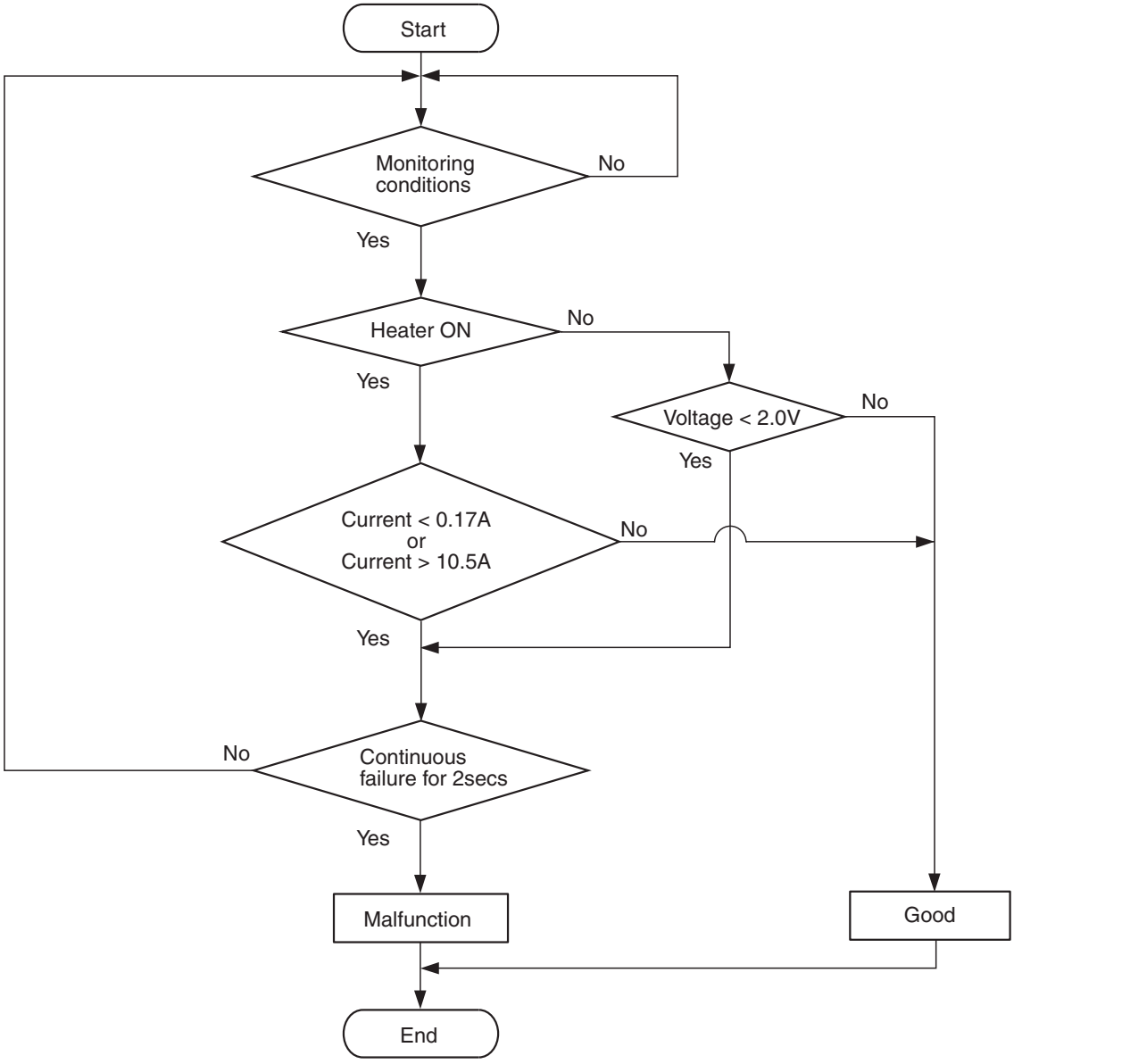
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (front) heater circuit, harness damage or connector damage.
- Heated oxygen sensor (front) heater failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector C-44 at the heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

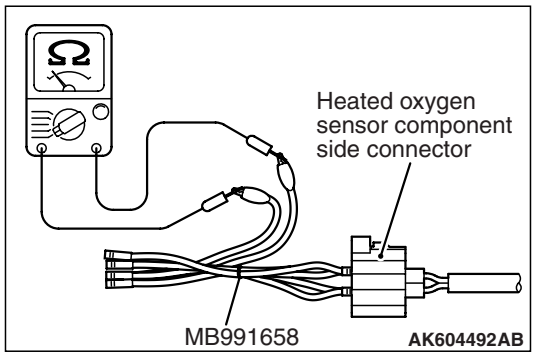
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector C-44 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (front) side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (front). Then go to Step 12.

STEP 3. Measure the power supply voltage at heated oxygen sensor (front) harness side connector C-44.

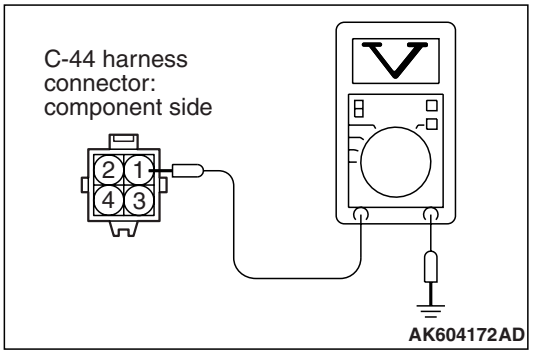
(1) Disconnect the connector C-44 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at the MFI relay for damage.

Q: Is the harness connector in good condition?

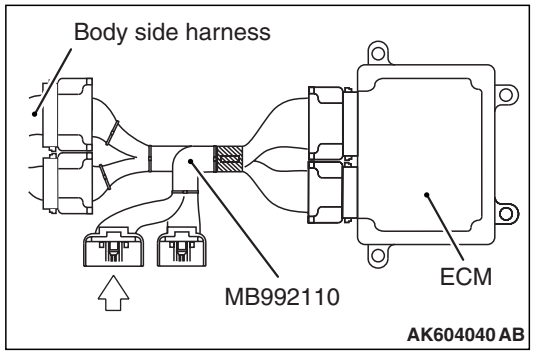
YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (front) connector C-44 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



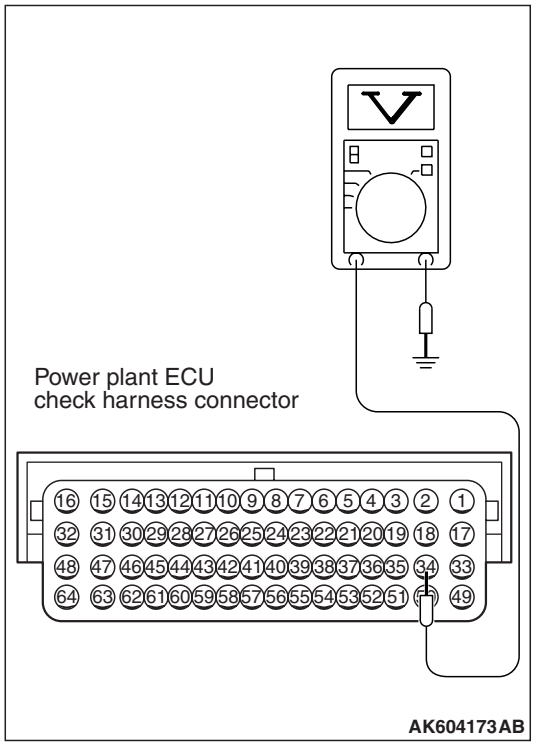
(3) Measure the voltage between terminal No. 34 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (front) connector C-44 (terminal No. 2) and ECM connector B-108 (terminal No. 34).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (front) connector C-44 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between heated oxygen sensor (front) connector C-44 (terminal No. 2) and ECM connector B-108 (terminal No. 34).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0031 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

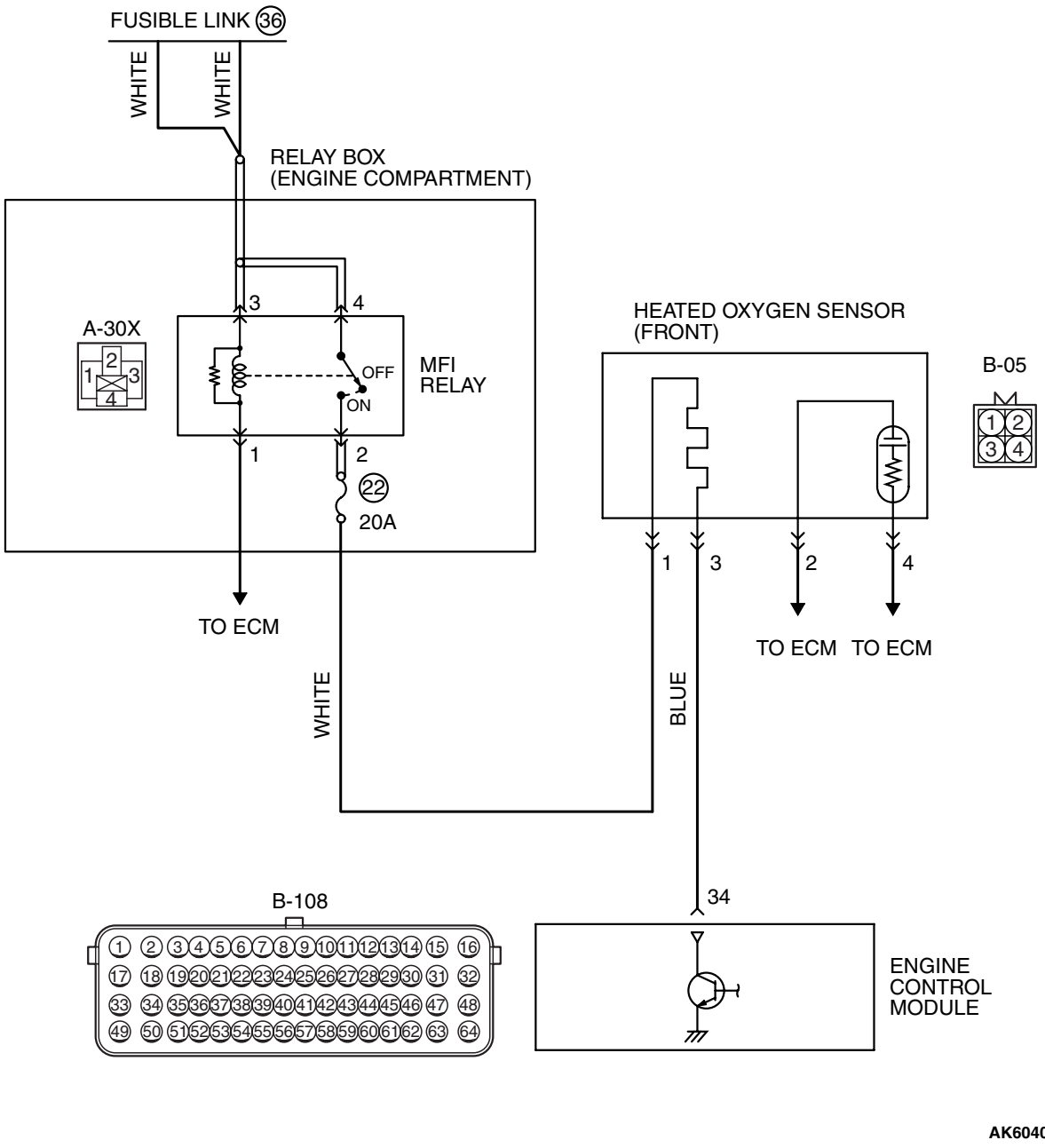
Q: Is DTC P0031 set?

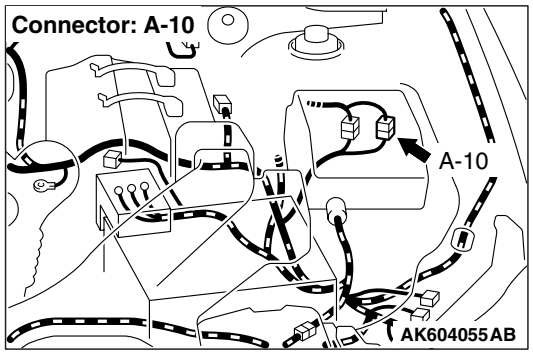
YES : Retry the troubleshooting.

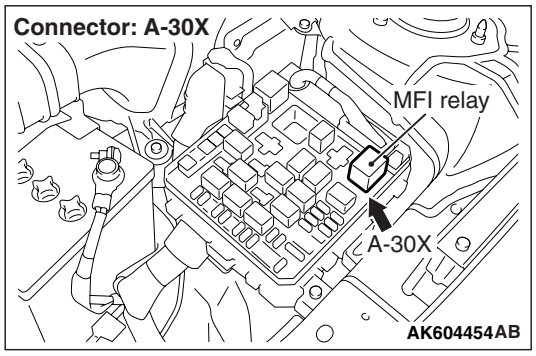
NO : The inspection is complete.

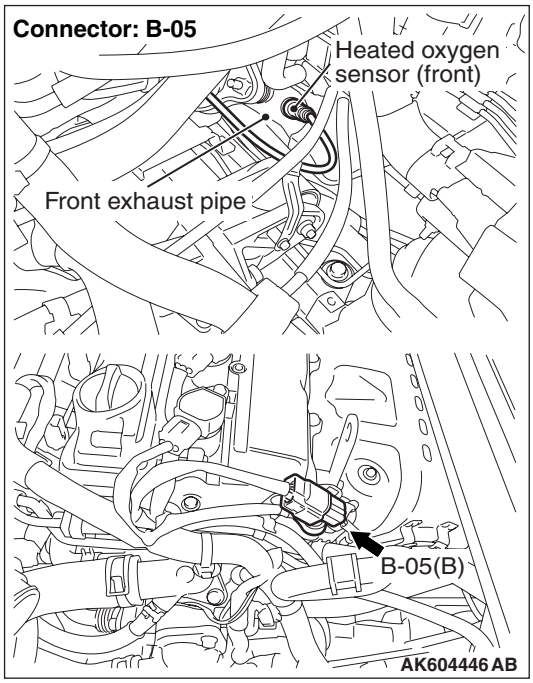
DTC P0031: Heated Oxygen Sensor (front) Heater Control Circuit Low <Calfornia>

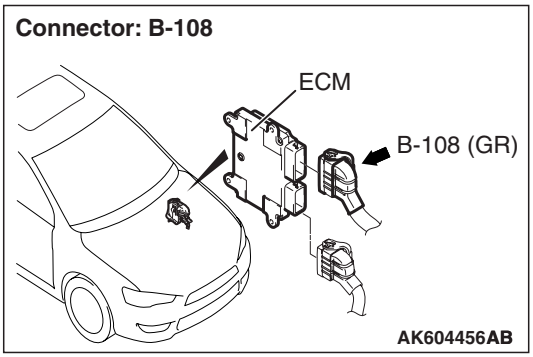
HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT <CALIFORNIA>











CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.
- The ECM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (front) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

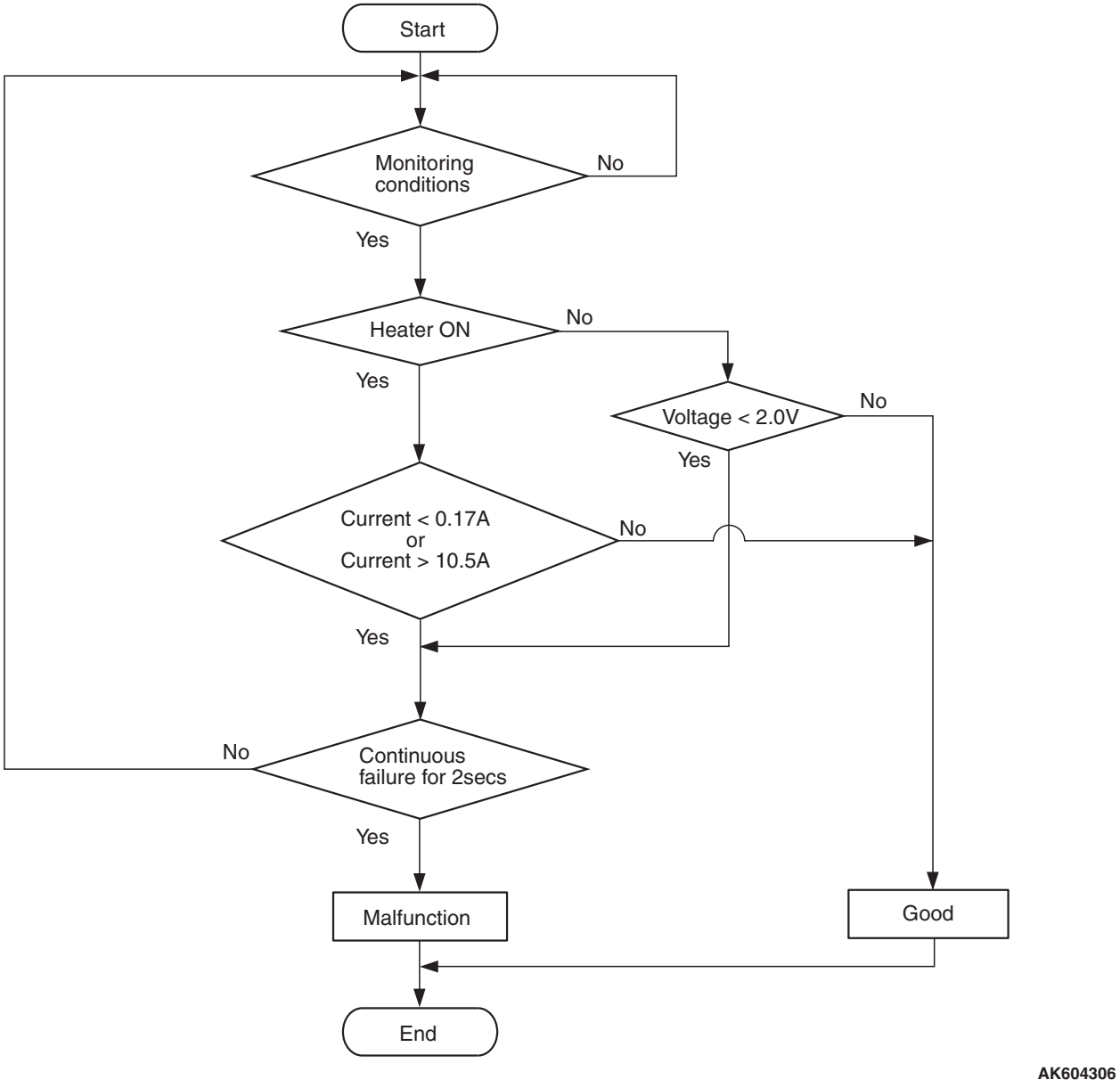
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (front) heater circuit, harness damage or connector damage.
- Heated oxygen sensor (front) heater failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MD998464: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector B-05 at the heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

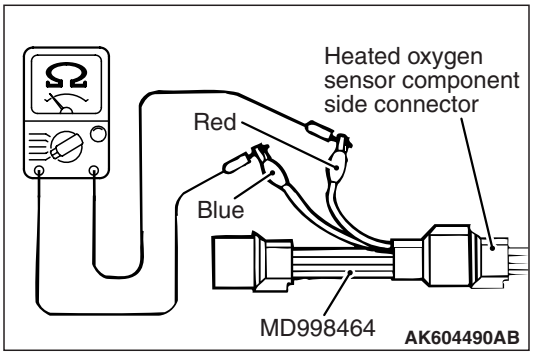
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector B-05 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (front). Then go to Step 12.

STEP 3. Measure the power supply voltage at heated oxygen sensor (front) harness side connector B-05.

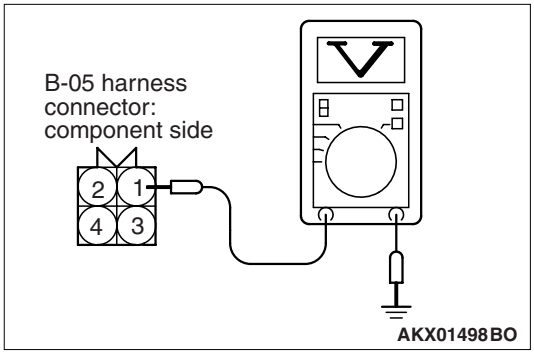
(1) Disconnect the connector B-05 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at the MFI relay for damage.

Q: Is the harness connector in good condition?

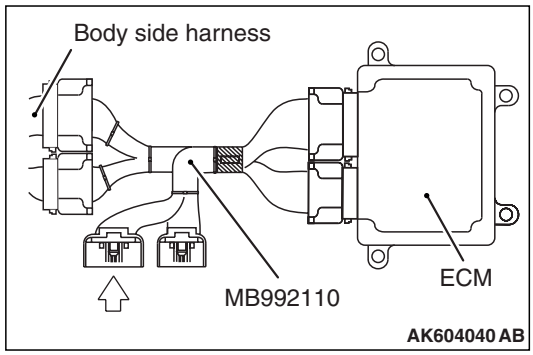
YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (front) connector B-05 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



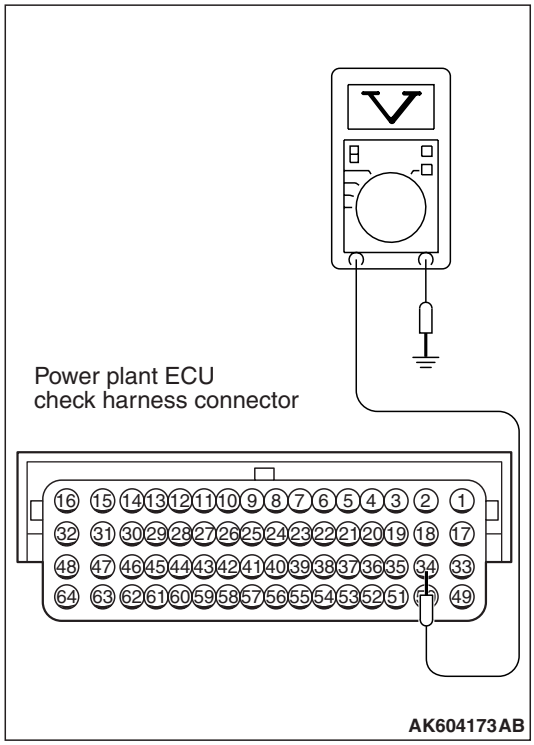
(3) Measure the voltage between terminal No. 34 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (front) connector B-05 (terminal No. 3) and ECM connector B-108 (terminal No. 34).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (front) connector B-05 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between heated oxygen sensor (front) connector B-05 (terminal No. 3) and ECM connector B-108 (terminal No. 34).

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0031 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

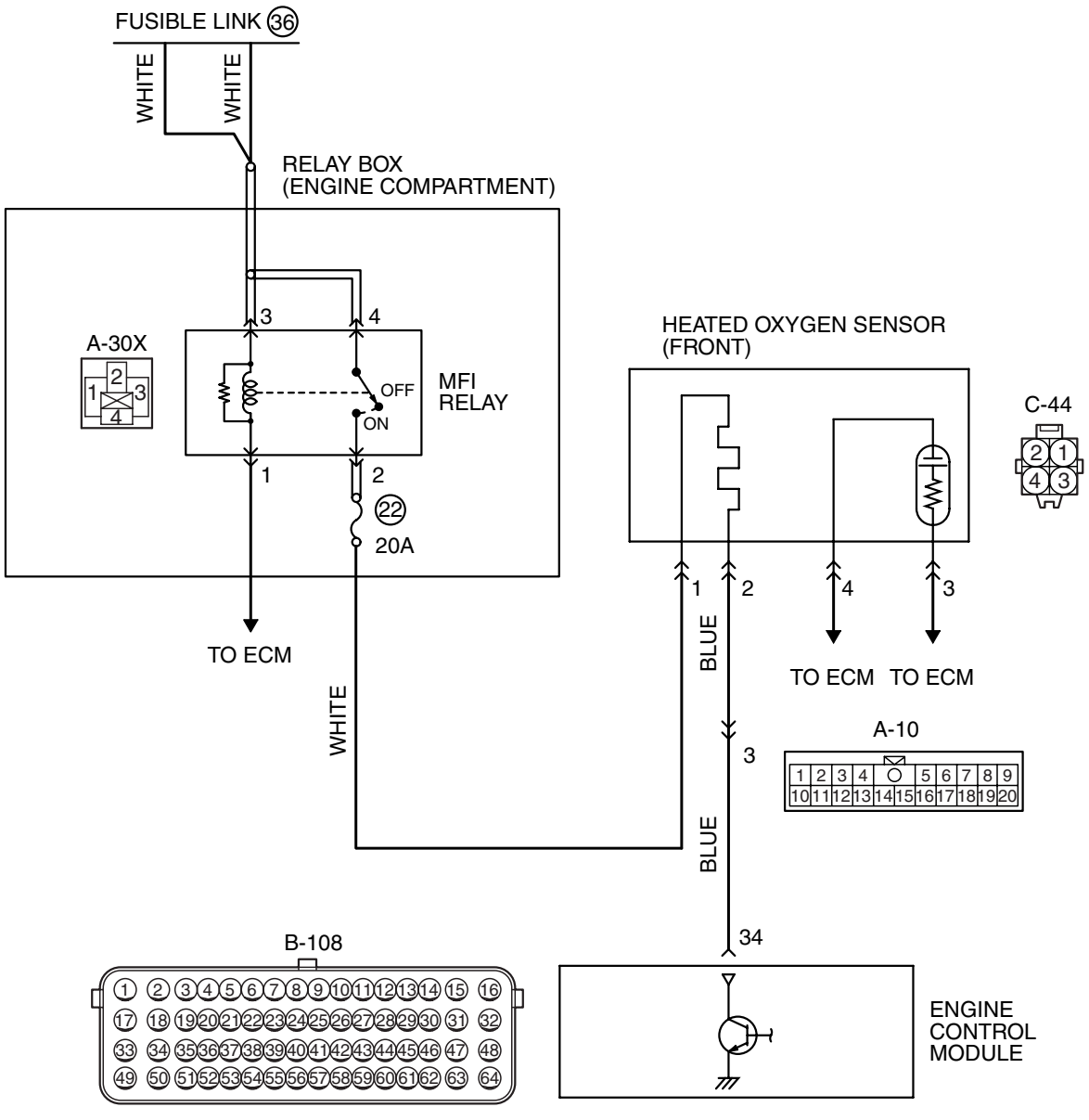
Q: Is DTC P0031 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0032: Heated Oxygen Sensor (front) Heater Control Circuit High <Except for California>

HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT <EXCEPT FOR CALIFORNIA>



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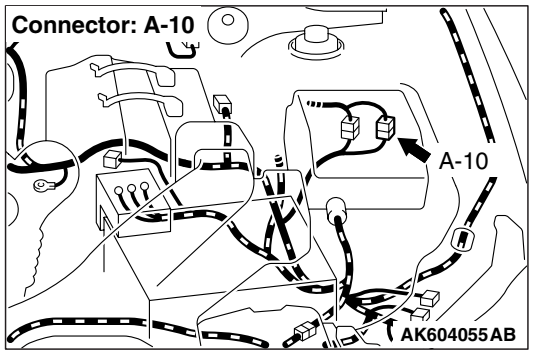
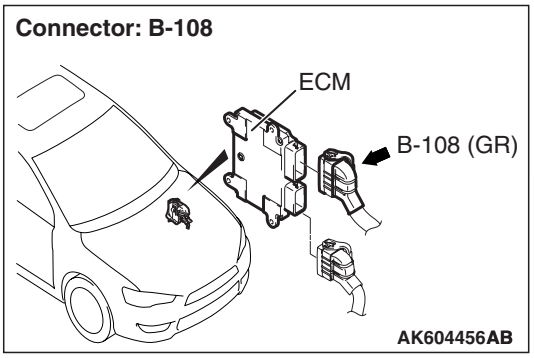
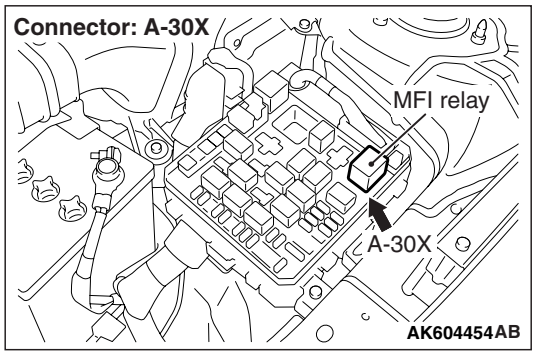
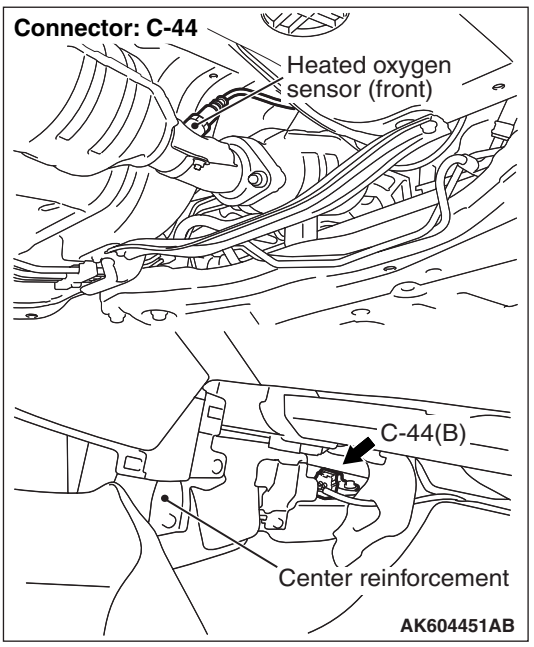








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (front) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

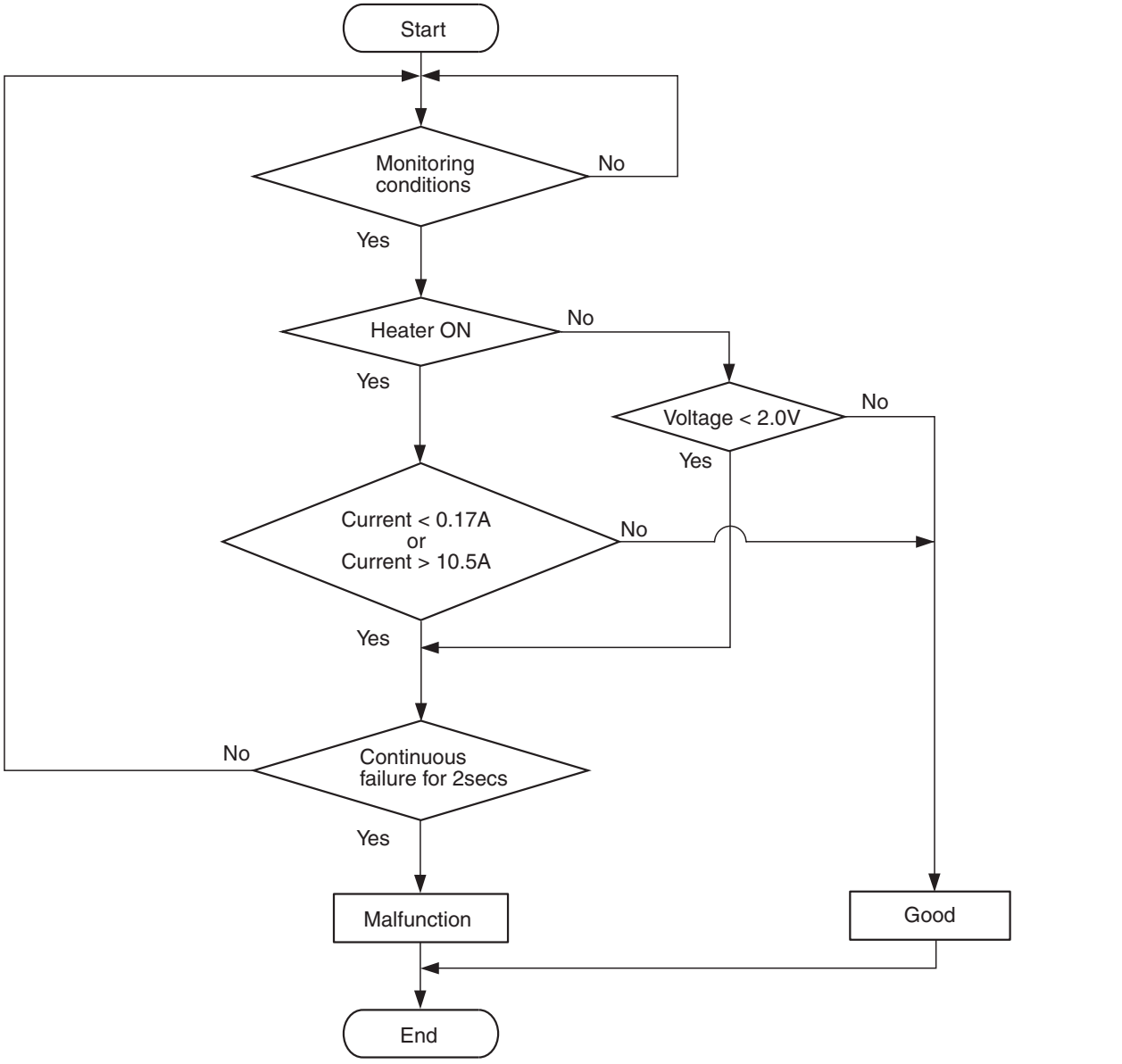
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

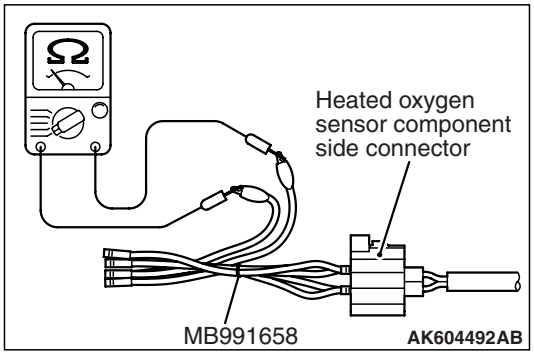
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) heater failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991658: Test Harness



STEP 1. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector C-44 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (front) side.
(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 2.
NO : Replace the heated oxygen sensor (front). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

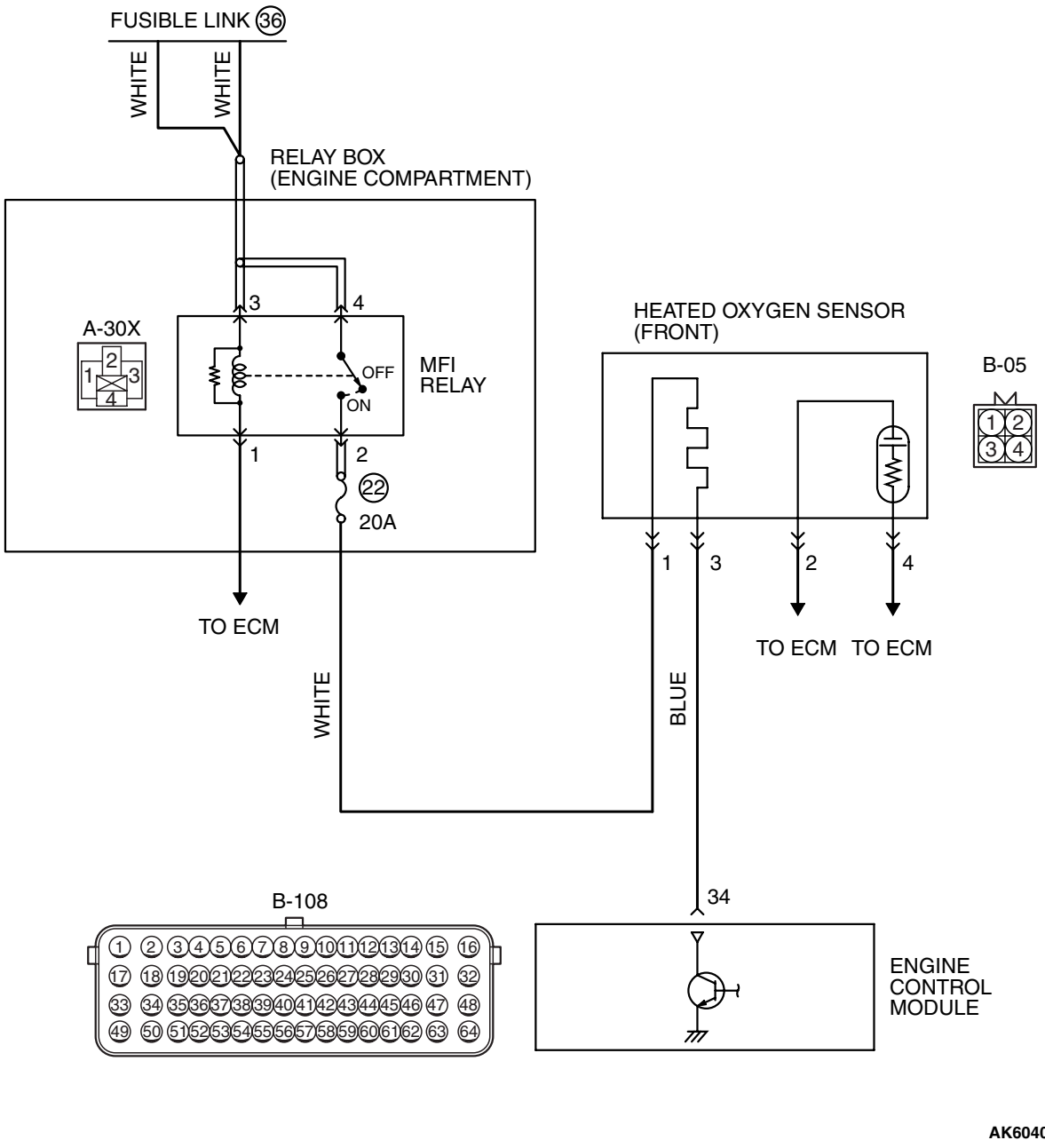
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

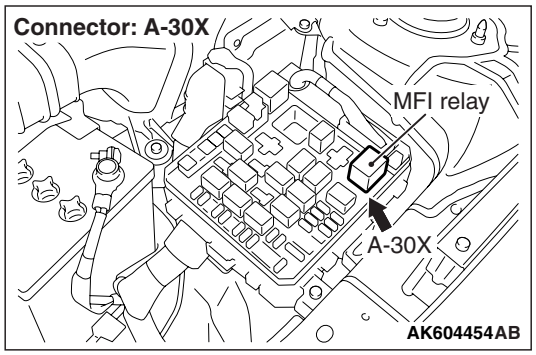
Q: Is DTC P0032 set?

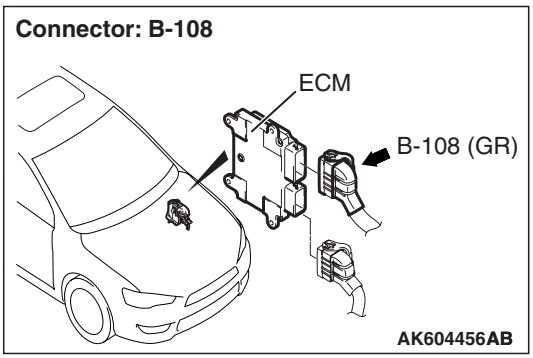
YES : Retry the troubleshooting.
NO : The inspection is complete.

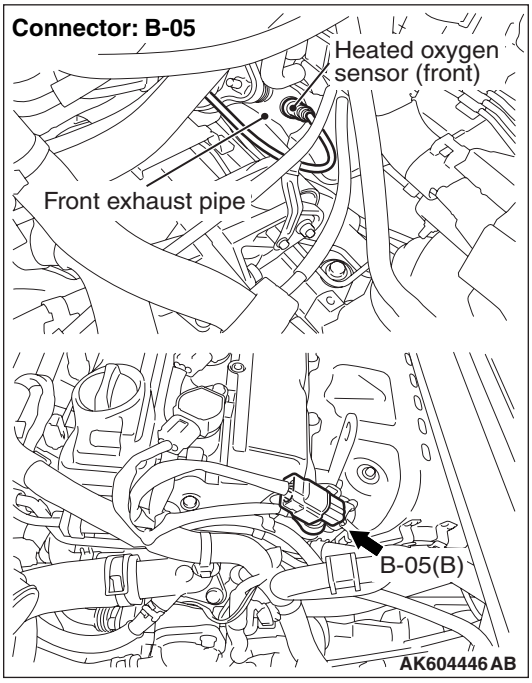
DTC P0032: Heated Oxygen Sensor (front) Heater Control Circuit High <California>

HEATED OXYGEN SENSOR (FRONT) HEATER CIRCUIT <CALIFORNIA>









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (front) heater.
- The ECM (terminal No. 34) controls continuity to the heated oxygen sensor (front) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (front) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

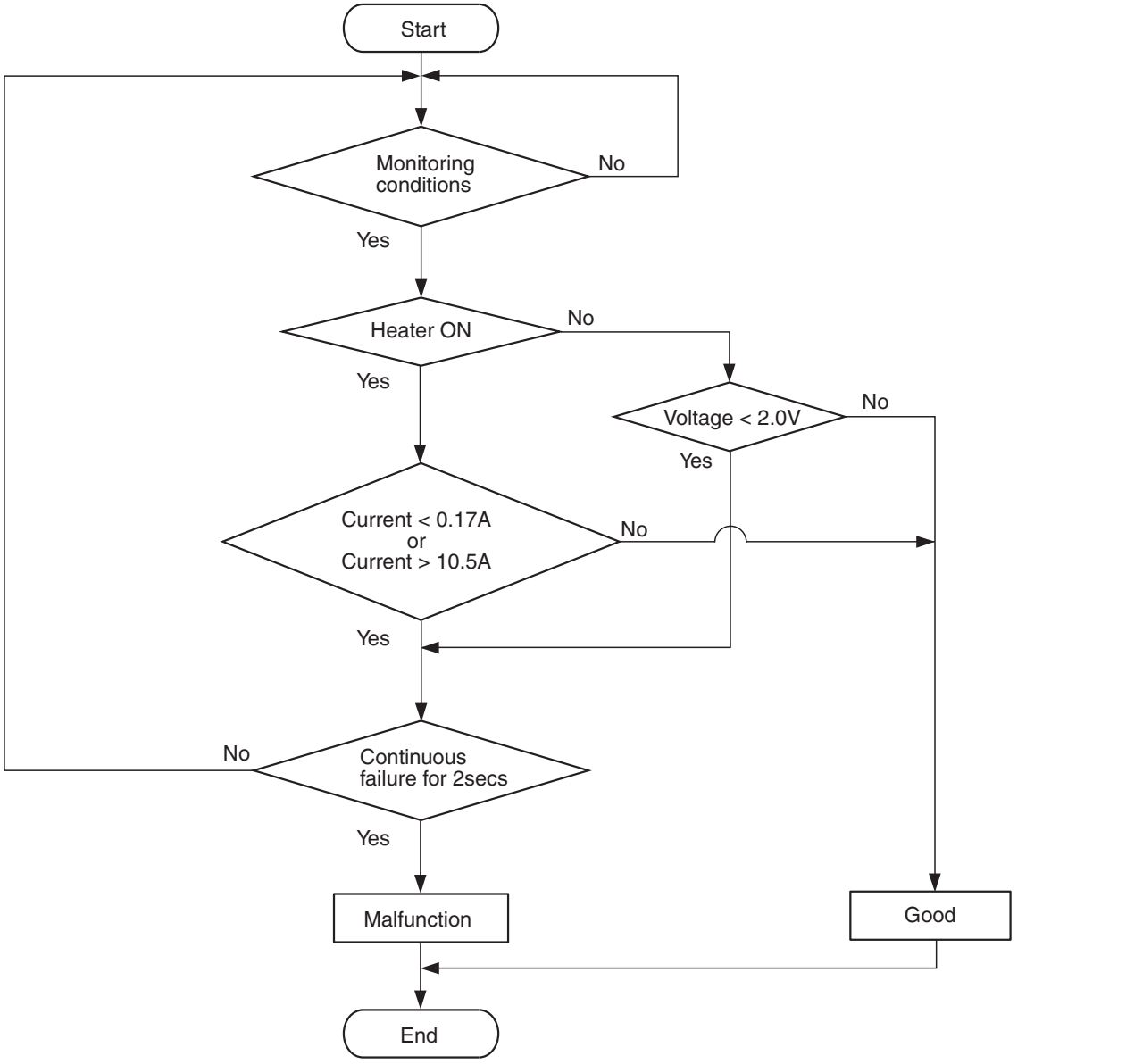
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (front) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (front) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

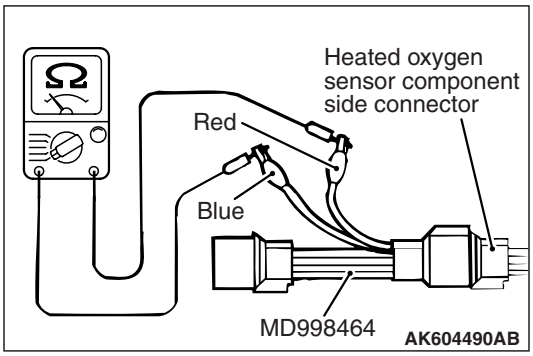
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) heater failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MD998464: Test Harness



STEP 1. Check the heated oxygen sensor (front).

(1) Disconnect heated oxygen sensor (front) connector B-05 and connect test harness special tool, MD998464, to the connector on the heated oxygen sensor (front) side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 (red clip) and terminal No. 3 (blue clip).

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 2.

NO : Replace the heated oxygen sensor (front). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0032 set?

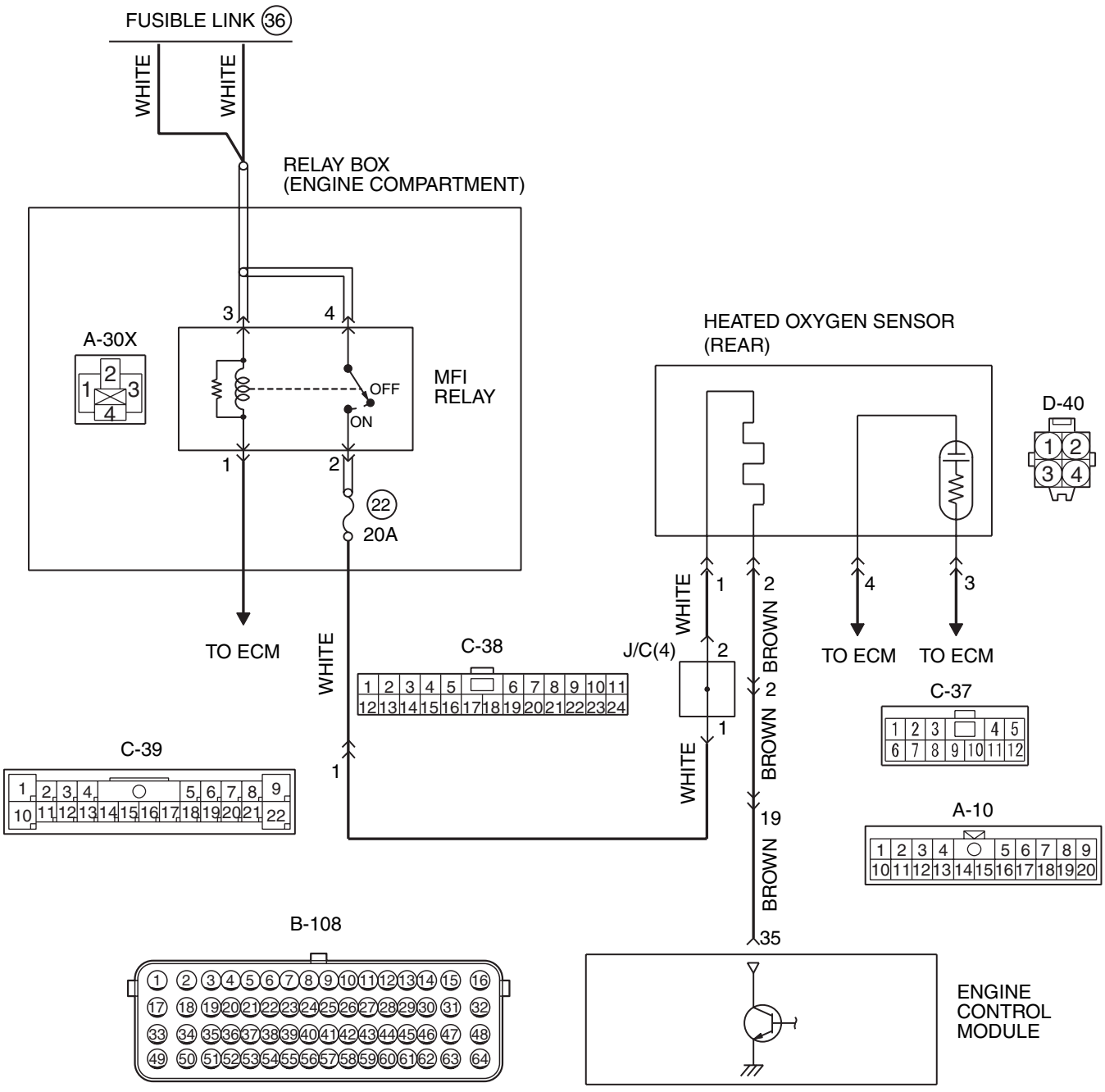
YES : Retry the troubleshooting.

NO : The inspection is complete.

TSB Revision

DTC P0037: Heated Oxygen Sensor (rear) Heater Control Circuit Low <Except for California>

HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT <EXCEPT FOR CALIFORNIA>



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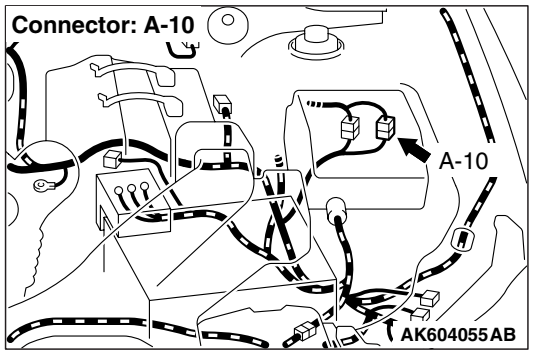
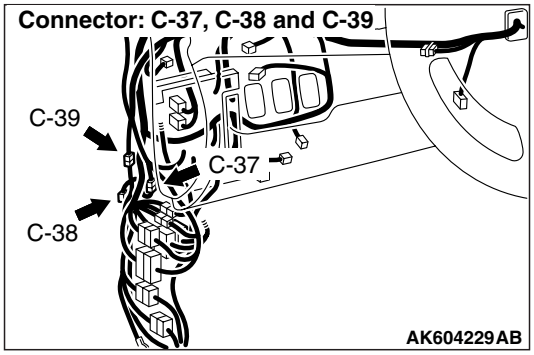
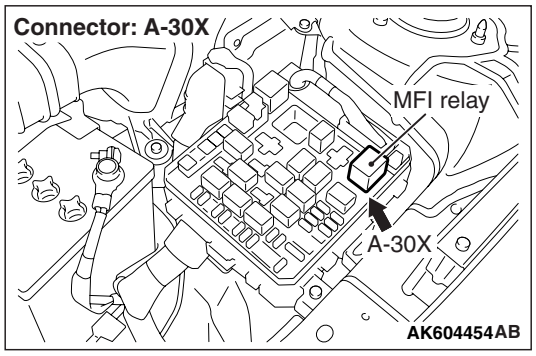
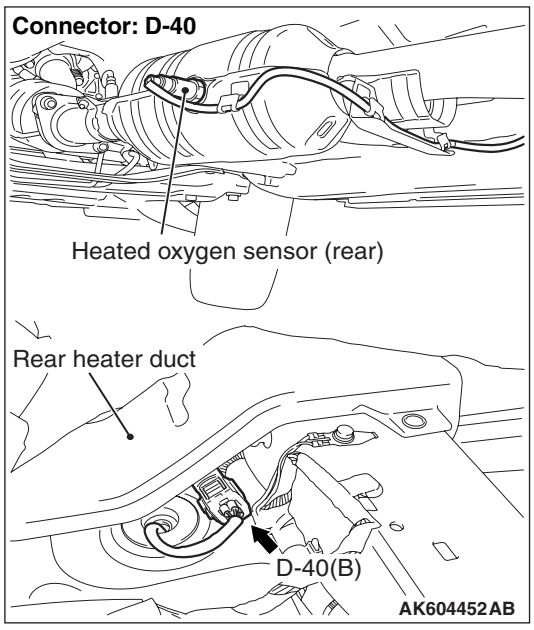
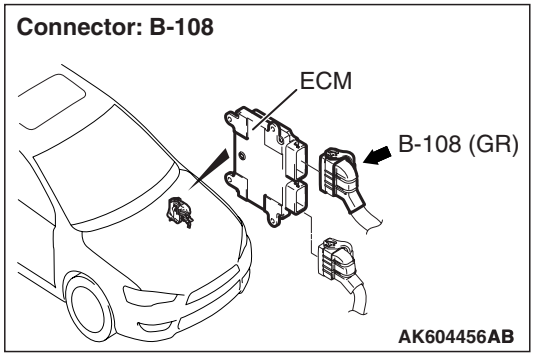
TSB Revision











CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (rear) heater.
- The ECM (terminal No. 35) controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.
- The ECM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) heater current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

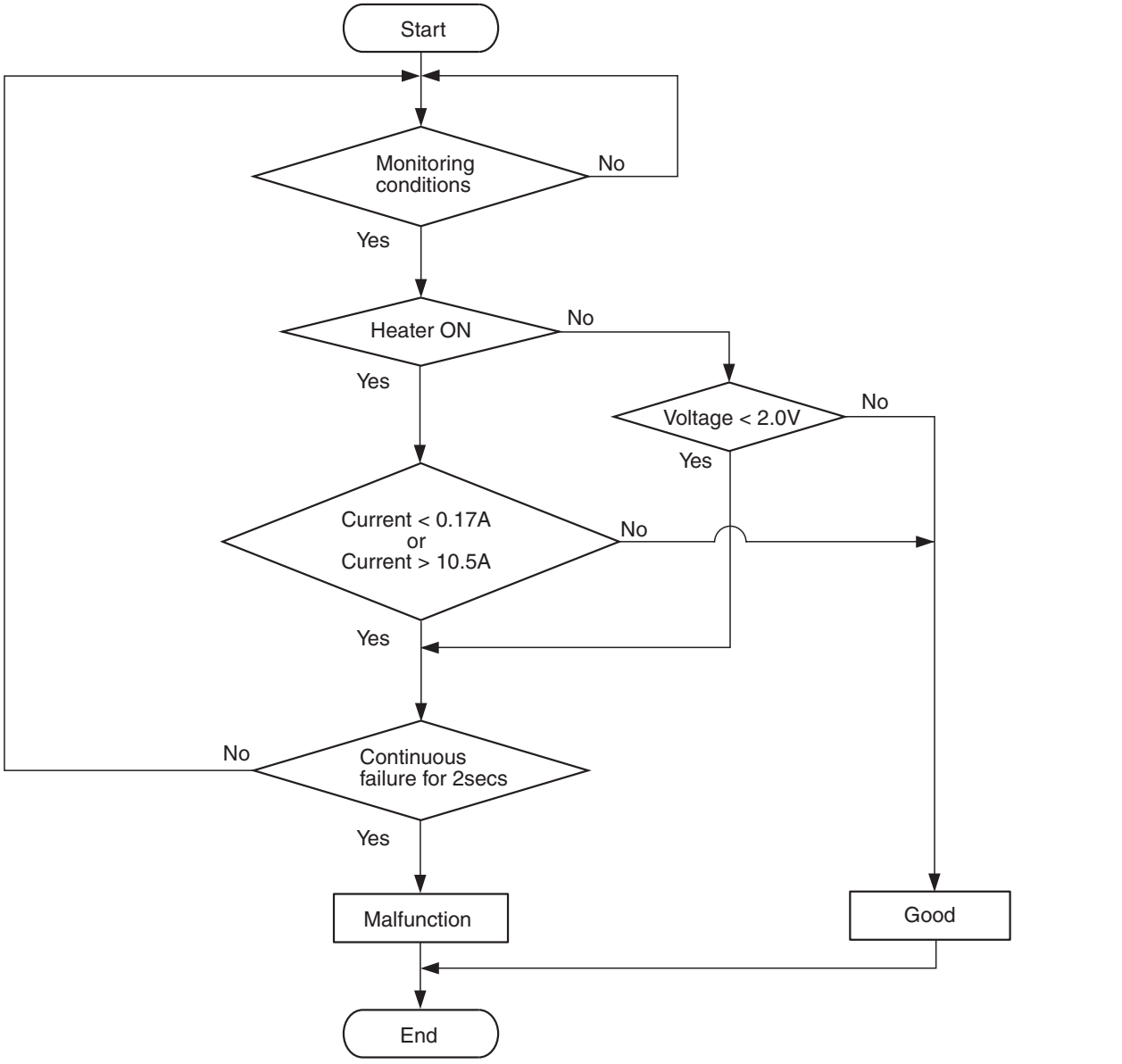
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (rear) heater circuit, or harness damage.
- Heated oxygen sensor (rear) heater failed.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector D-40 at the heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

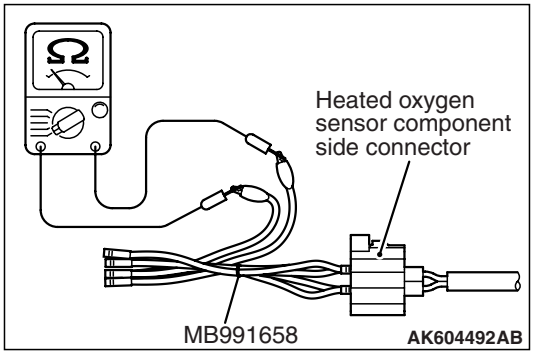
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the heated oxygen sensor (rear).

(1) Disconnect heated oxygen sensor (rear) connector D-40 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Measure the power supply voltage at heated oxygen sensor (rear) harness side connector D-40.

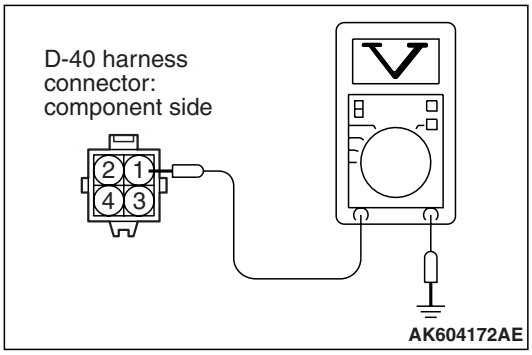
(1) Disconnect the connector D-40 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at the MFI relay for damage.

Q: Is the harness connector in good condition?

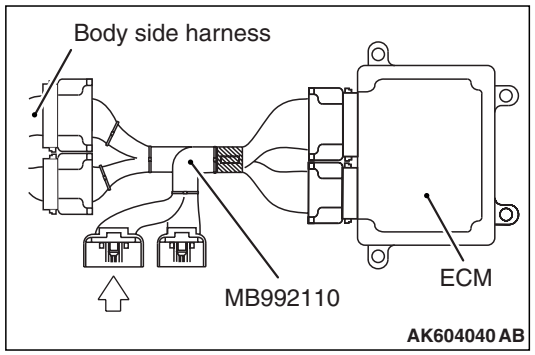
YES : Check harness connector C-38 and C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (rear) connector D-40 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



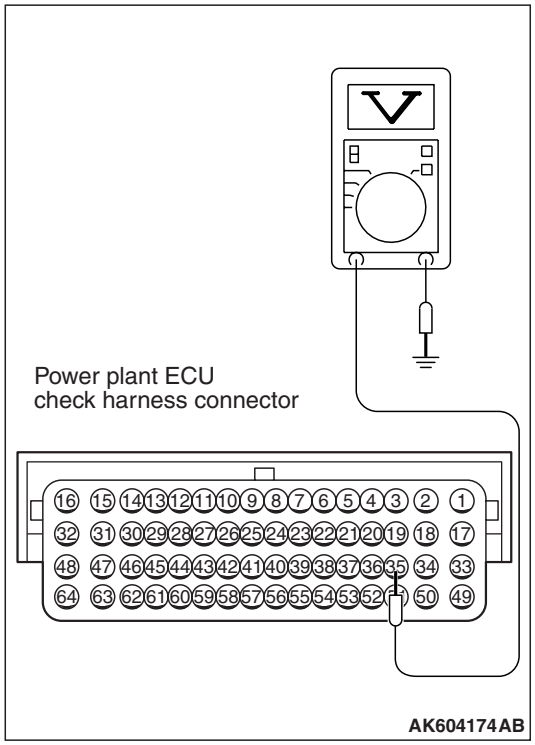
(3) Measure the voltage between terminal No. 35 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (rear) connector D-40 (terminal No. 2) and ECM connector B-108 (terminal No. 35).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (rear) connector D-40 (terminal No. 1).

NOTE: Check harness after checking intermediate connector C-38 and C-39. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between heated oxygen sensor (rear) connector D-40 (terminal No. 2) and ECM connector B-108 (terminal No. 35).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0037 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 12. Test the OBD-II drive cycle.

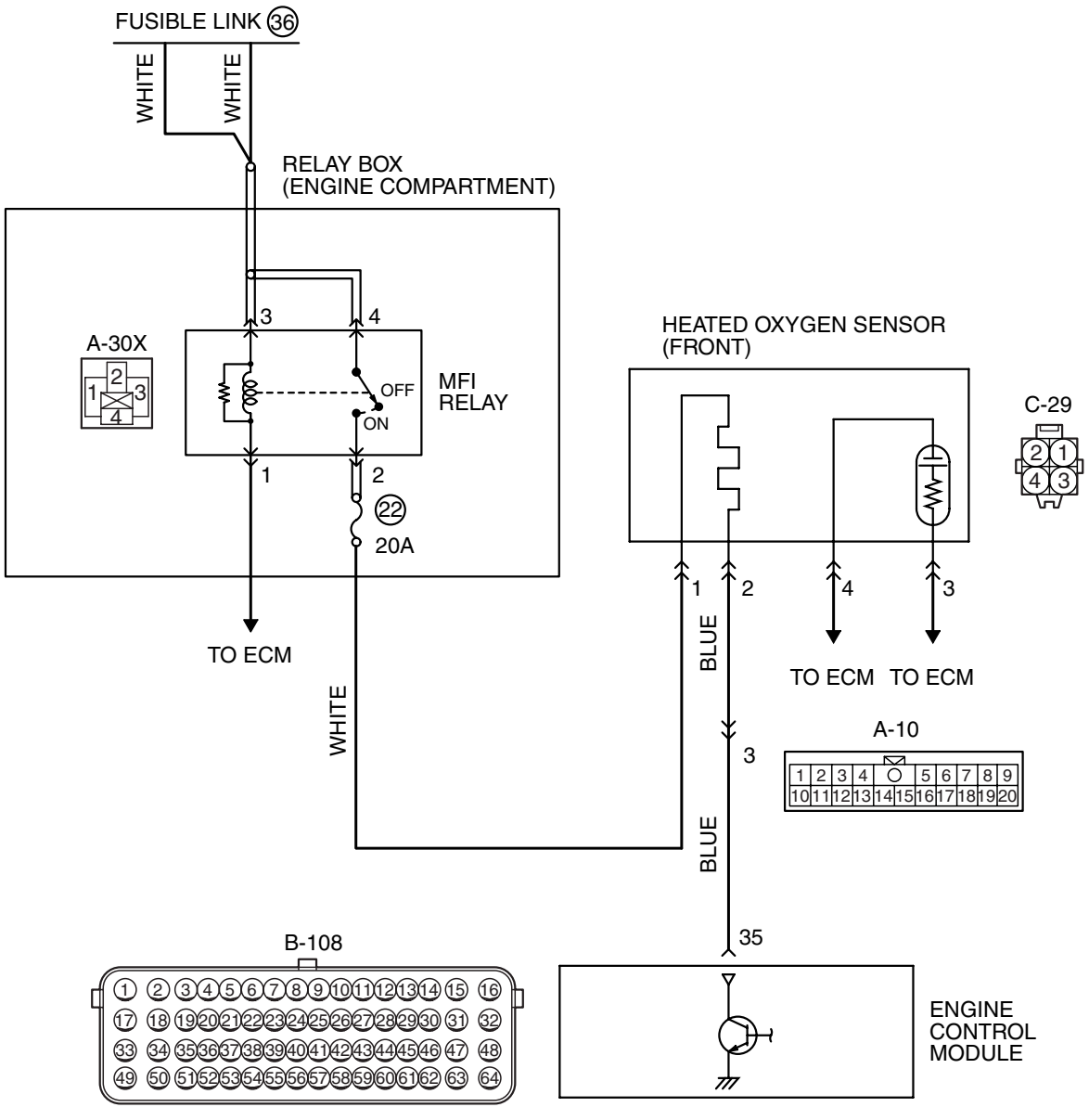
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0037 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0037: Heated Oxygen Sensor (rear) Heater Control Circuit Low <California>

HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT <CALIFORNIA>



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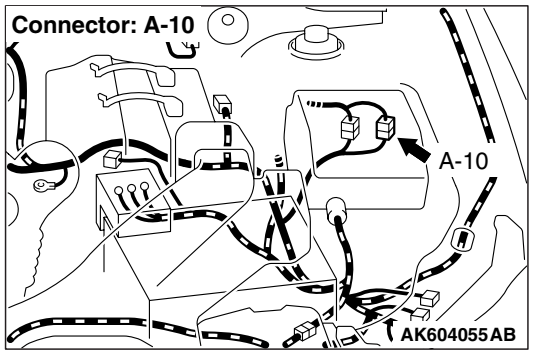
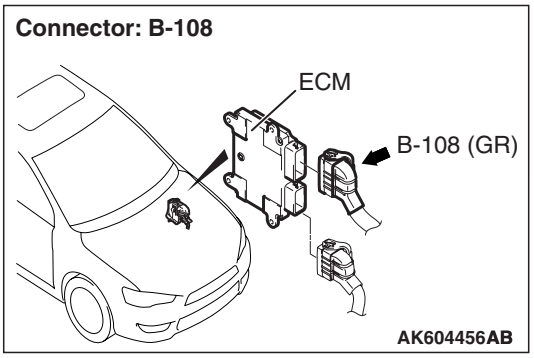
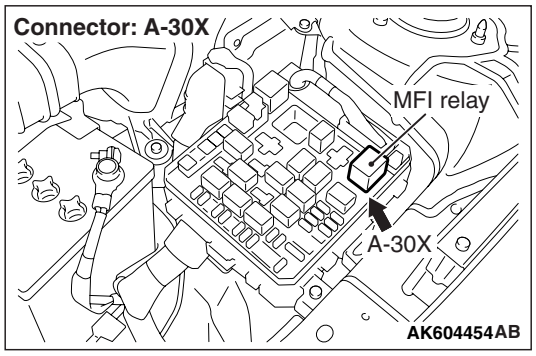
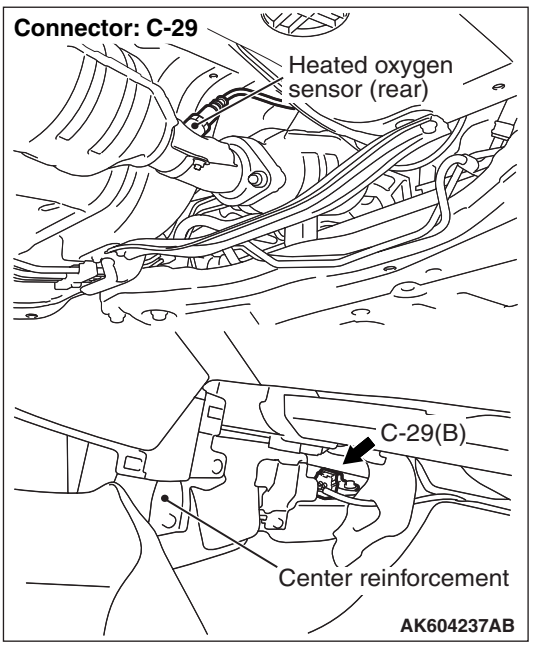








CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (rear) heater.
- The ECM (terminal No. 35) controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.
- The ECM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (rear) current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

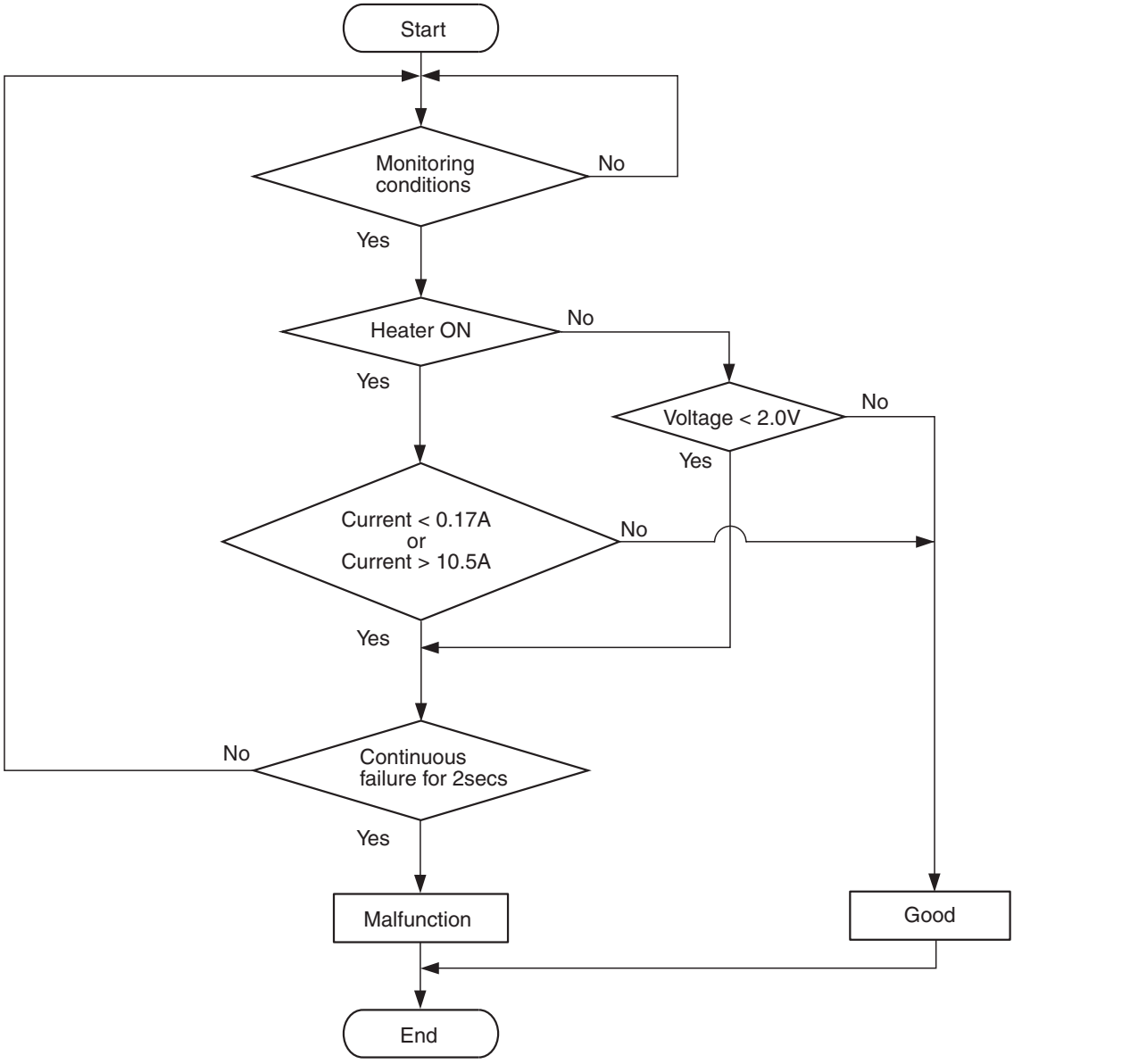
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (rear) heater circuit, or harness damage.
- Heated oxygen sensor (rear) heater failed.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector C-29 at the heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

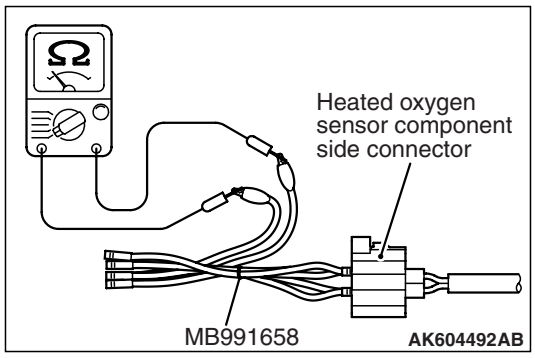
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the heated oxygen sensor (rear).

(1) Disconnect heated oxygen sensor (rear) connector C-29 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.

(2) Measure the resistance between heated oxygen sensor (rear) connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the heated oxygen sensor (rear). Then go to Step 12.

STEP 3. Measure the power supply voltage at heated oxygen sensor (rear) harness side connector C-29.

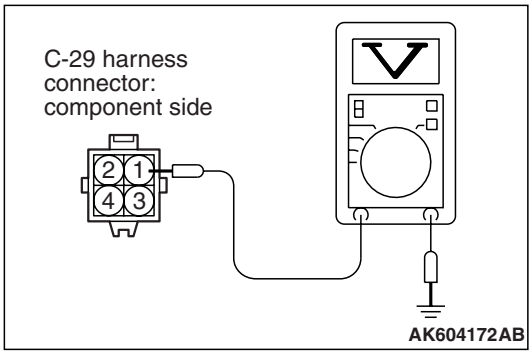
(1) Disconnect the connector C-29 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 1 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at the MFI relay for damage.

Q: Is the harness connector in good condition?

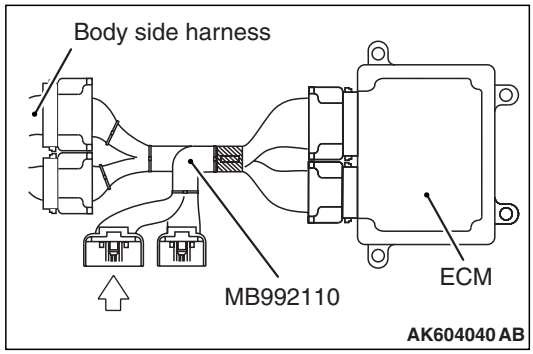
YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (rear) connector C-29 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



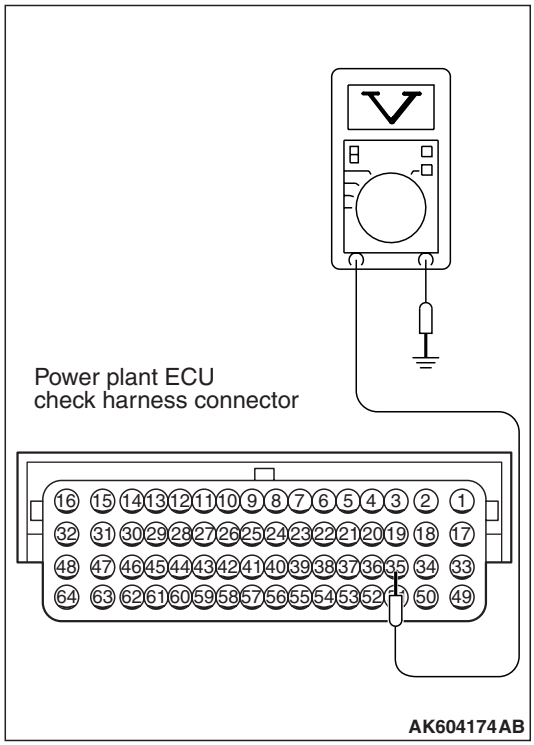
(3) Measure the voltage between terminal No. 35 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (rear) connector C-29 (terminal No. 2) and ECM connector B-108 (terminal No. 35).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (rear) connector C-29 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between heated oxygen sensor (rear) connector C-29 (terminal No. 2) and ECM connector B-108 (terminal No. 35).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0037 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 12. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

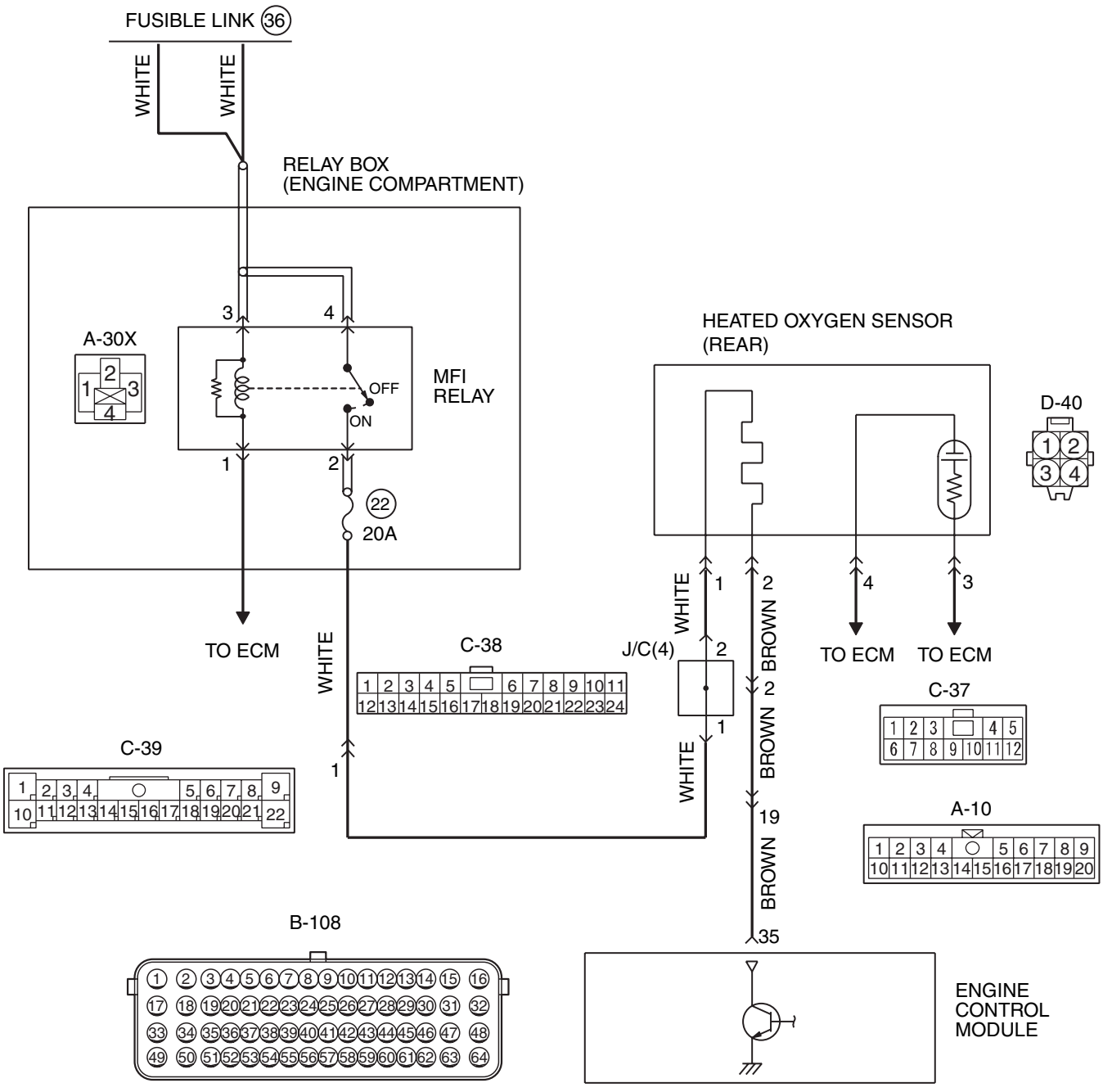
Q: Is DTC P0037 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0038: Heated Oxygen Sensor (rear) Heater Control Circuit High <Except for California>

HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT <EXCEPT FOR CALIFORNIA>



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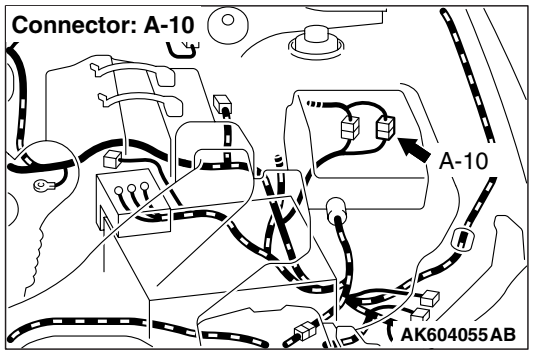
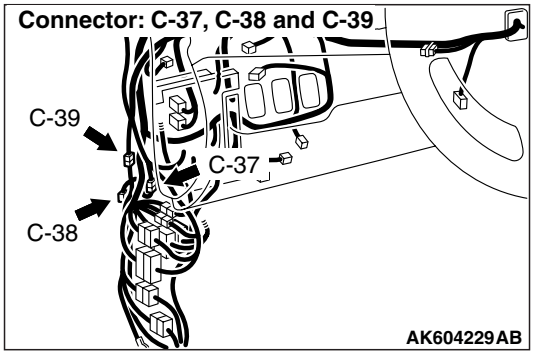
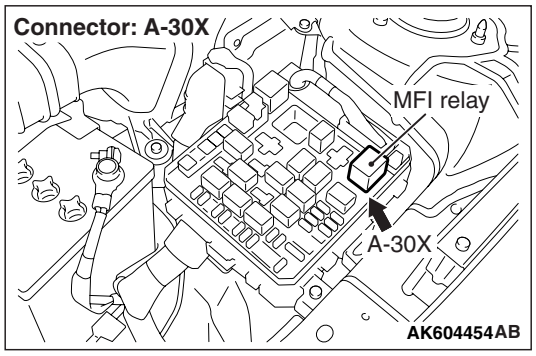
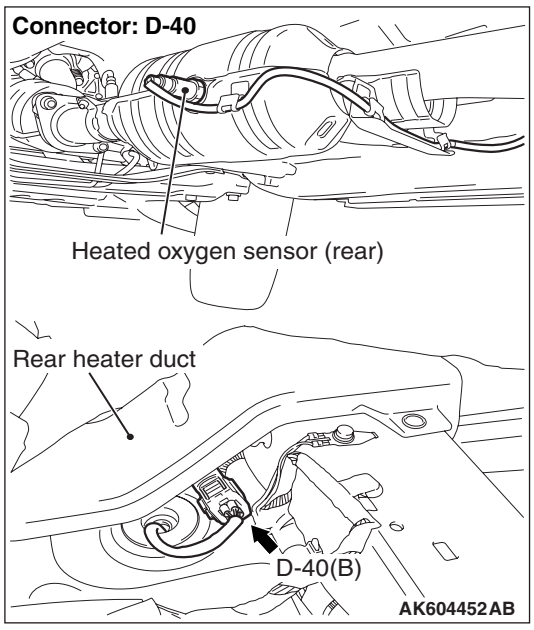
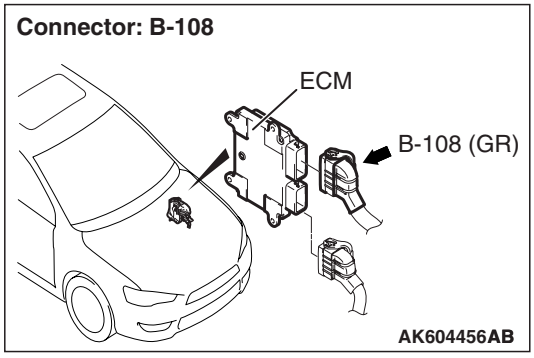










CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (rear) heater.
- The ECM (terminal No. 35) controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (rear) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

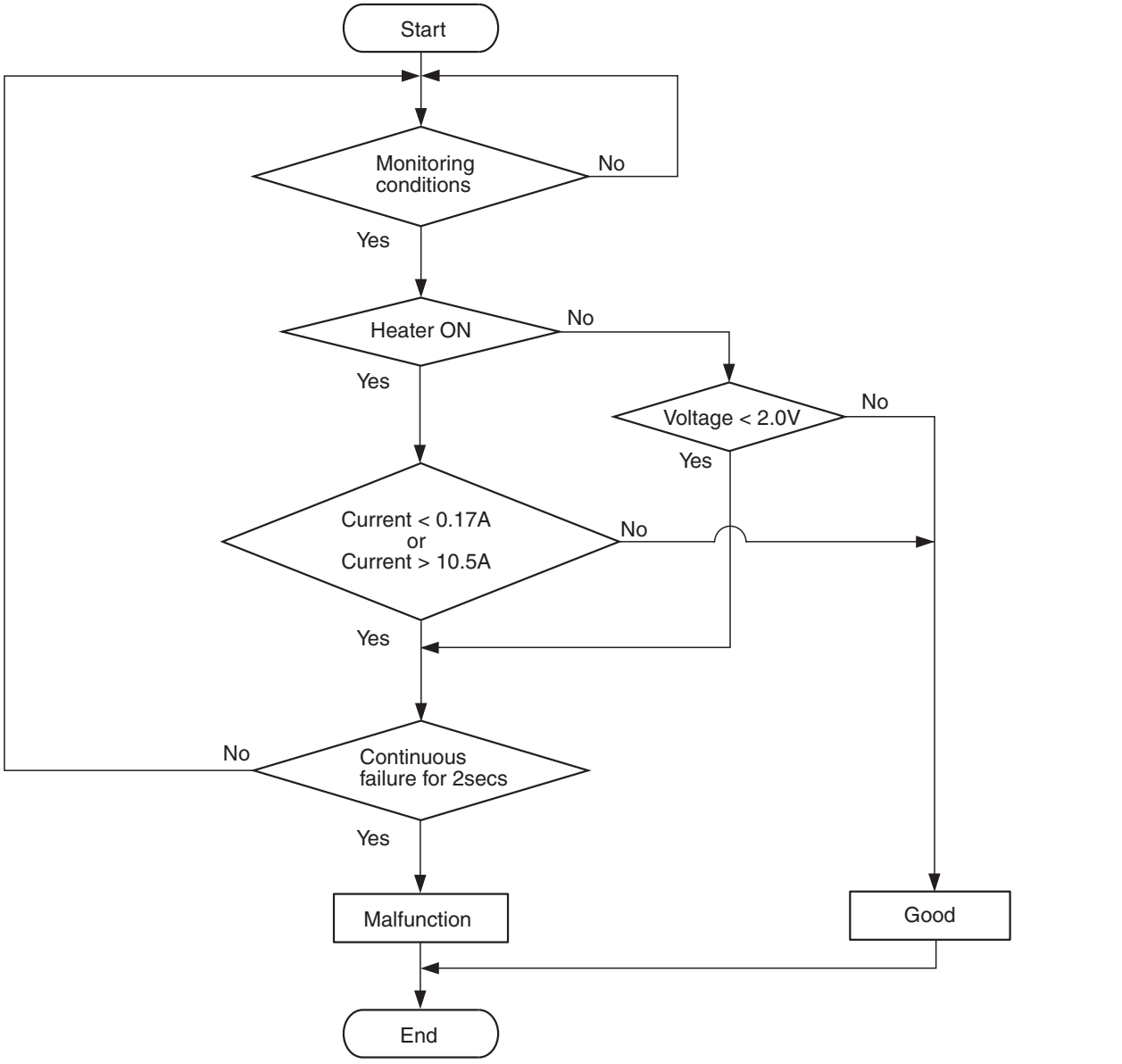
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

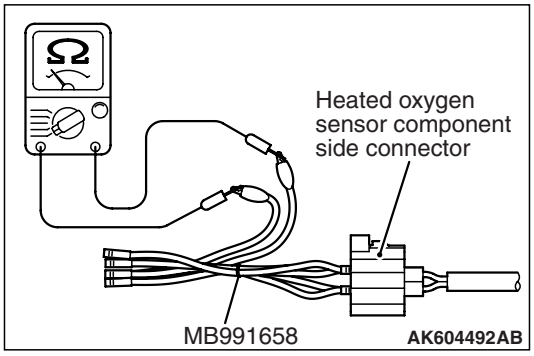
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- ECM failed.

DIAGNOSIS

Required Special Tool:
- MB991658: Test Harness



STEP 1. Check the heated oxygen sensor (rear).

(1) Disconnect heated oxygen sensor (rear) connector D-40 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.

(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 2.

NO : Replace the heated oxygen sensor (rear). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0038 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

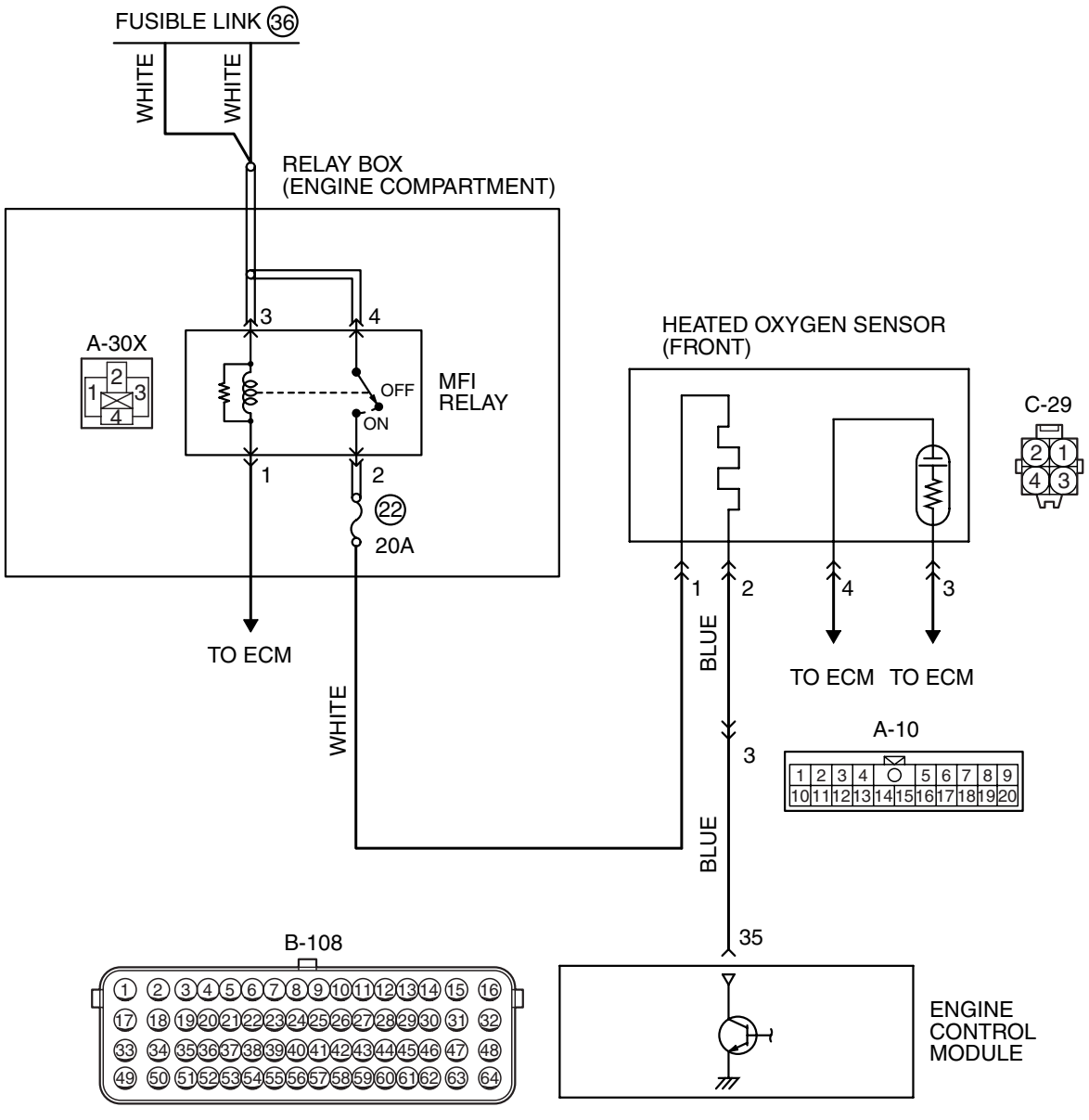
Q: Is DTC P0038 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0038: Heated Oxygen Sensor (rear) Heater Control Circuit High <California>

HEATED OXYGEN SENSOR (REAR) HEATER CIRCUIT <CALIFORNIA>



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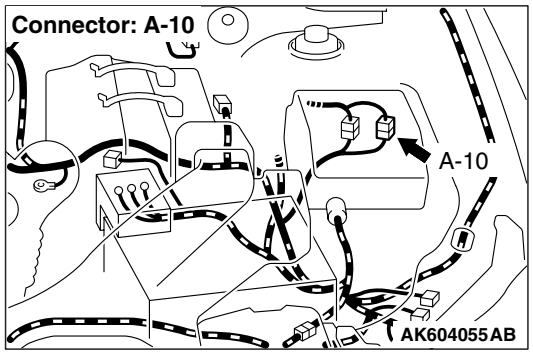
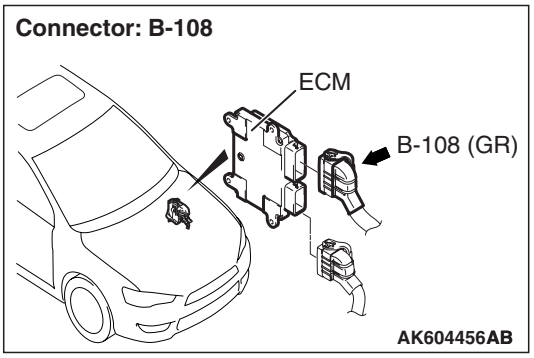
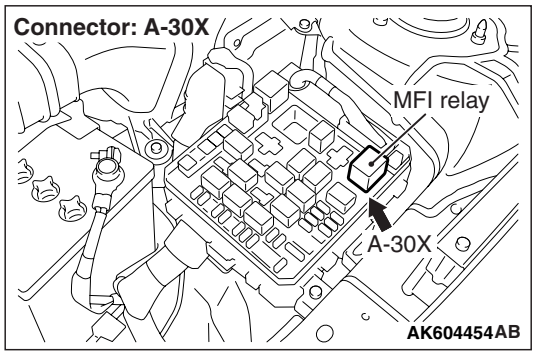
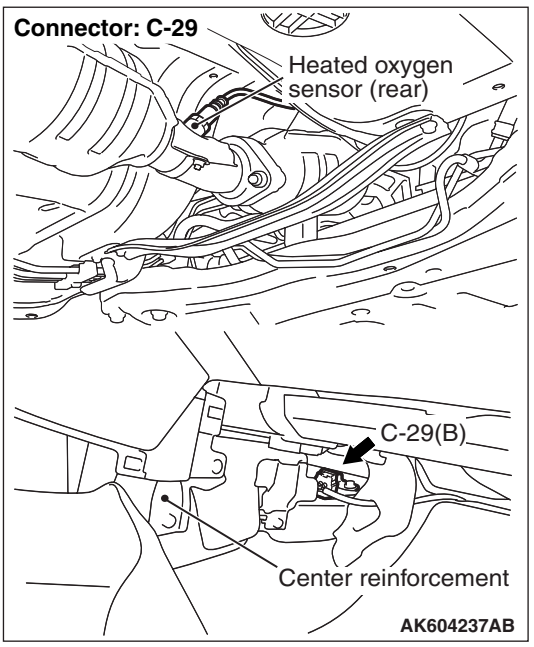
TSB Revision









CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (rear) heater.
- The ECM (terminal No. 35) controls continuity to the heated oxygen sensor (rear) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor heater (rear) current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

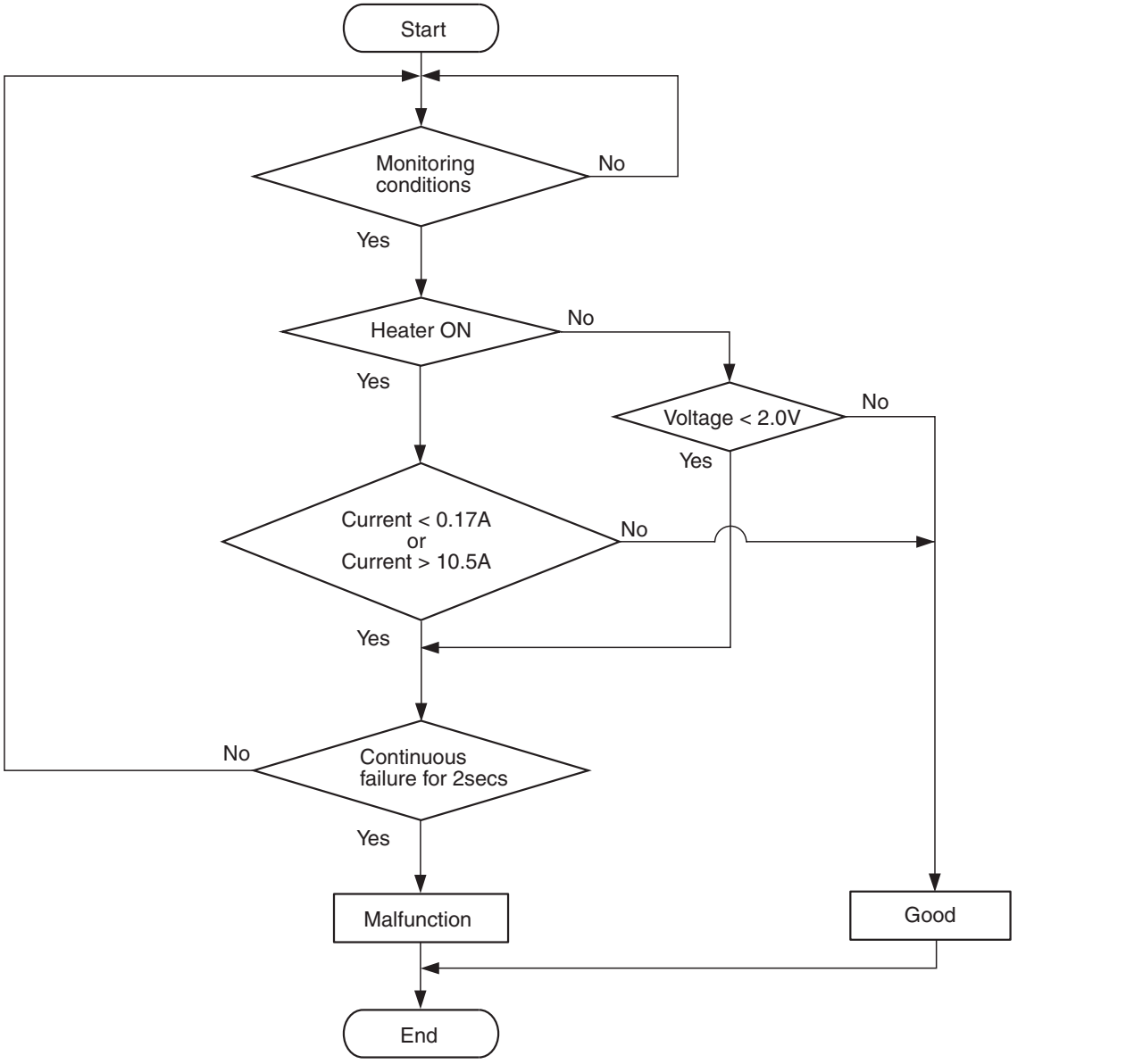
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (rear) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (rear) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

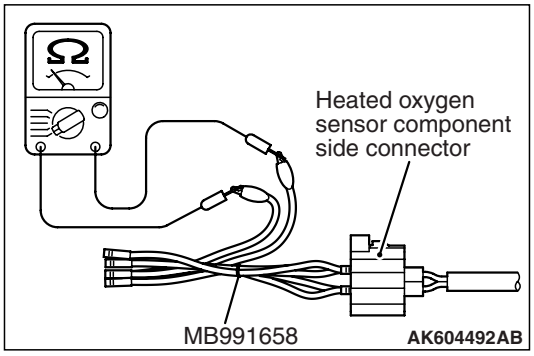
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) heater failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991658: Test Harness



STEP 1. Check the heated oxygen sensor (rear).

(1) Disconnect heated oxygen sensor (rear) connector C-29 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (rear) side.
(2) Measure the resistance between heated oxygen sensor (rear) connector terminal No. 1 and terminal No. 2.

Standard value: 4.5 –8.0 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 4.5 and 8.0 ohms [at 20° C (68° F)]?

YES : Go to Step 2.
NO : Replace the heated oxygen sensor (rear). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0038 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

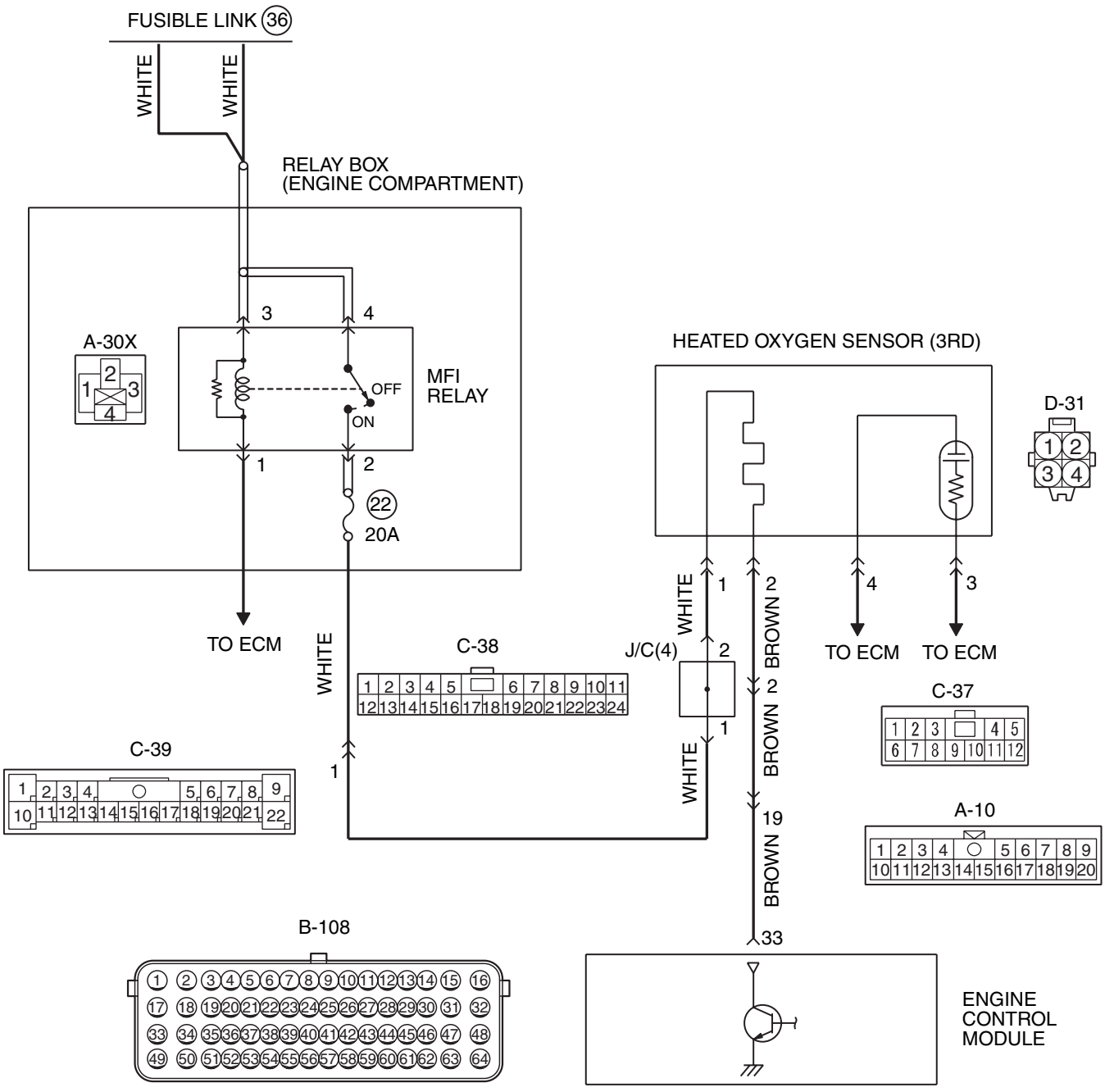
Q: Is DTC P0038 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

TSB Revision

DTC P0043: Heated Oxygen Sensor (3rd) Heater Control Circuit Low <California>

HEATED OXYGEN SENSOR (3RD) HEATER CIRCUIT <CALIFORNIA>



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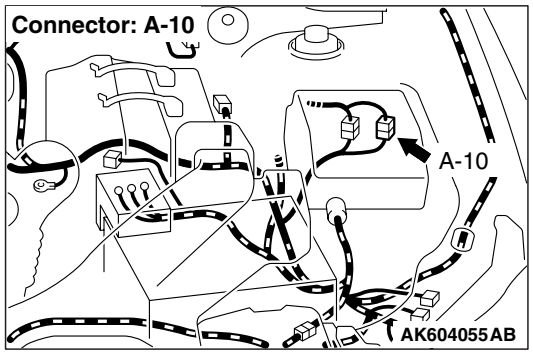
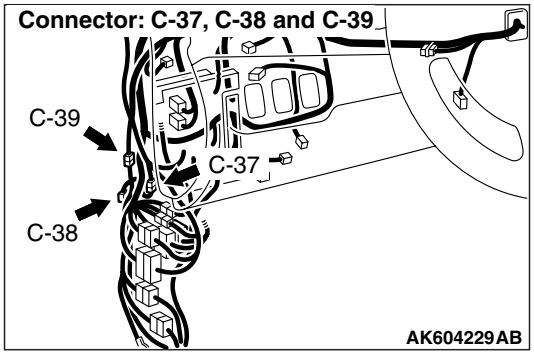
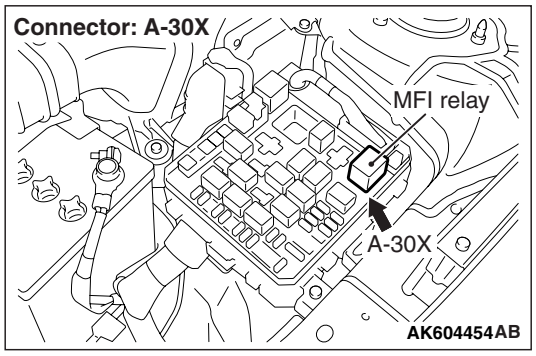
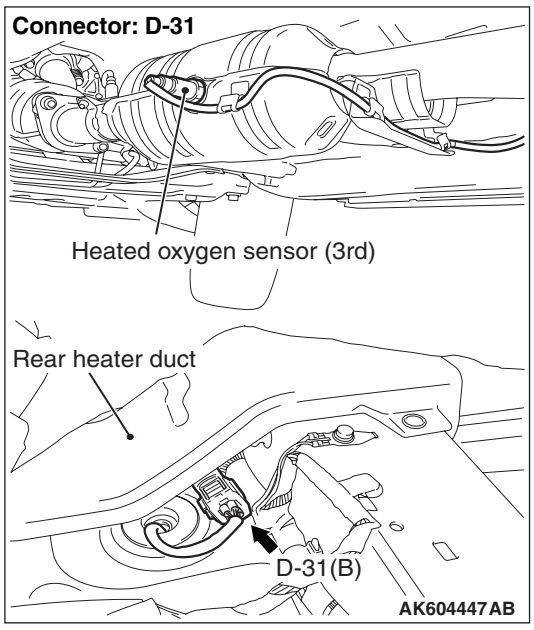
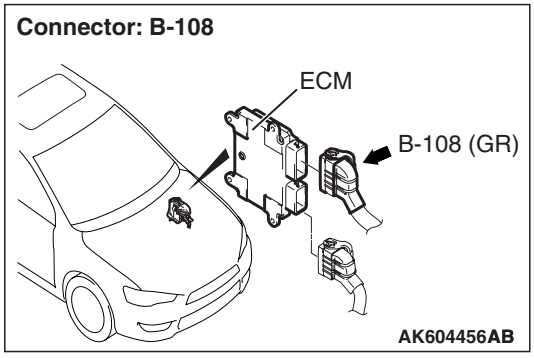
TSB Revision











CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (3rd) heater.
- The ECM (terminal No. 33) controls continuity to the heated oxygen sensor (3rd) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.
- The ECM checks whether the heater voltage is within a specified range when the heater is not energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) heater current or voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

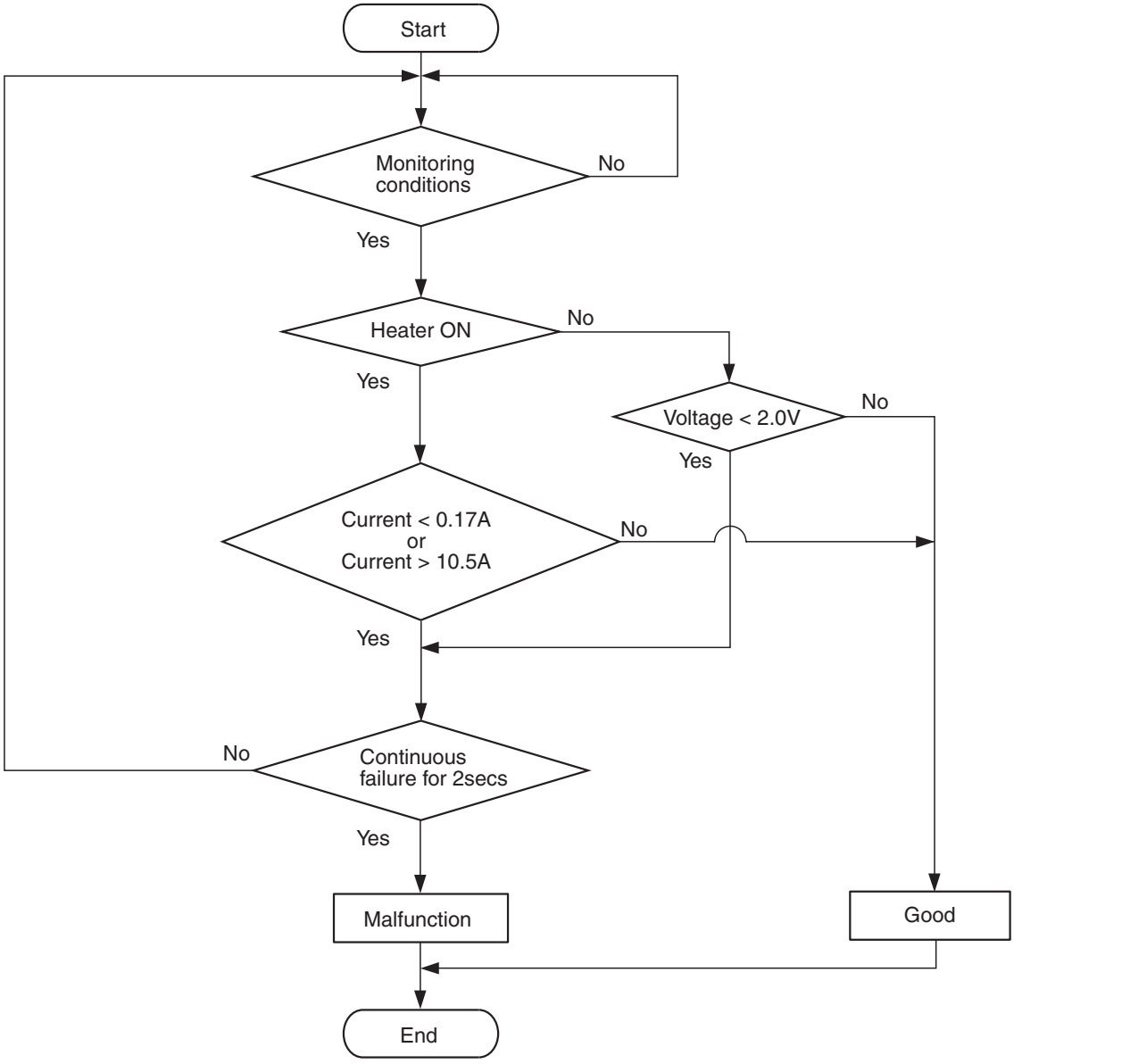
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (3rd) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (3rd) heater current has continued to be lower than 0.17 ampere for 2 seconds.

Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (3rd) heater is off.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (3rd) heater voltage has continued to be lower than 2.0 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

TSB Revision

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted heated oxygen sensor (3rd) heater circuit, or harness damage.
- Heated oxygen sensor (3rd) heater failed.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector D-31 at the heated oxygen sensor (3rd) for damage.

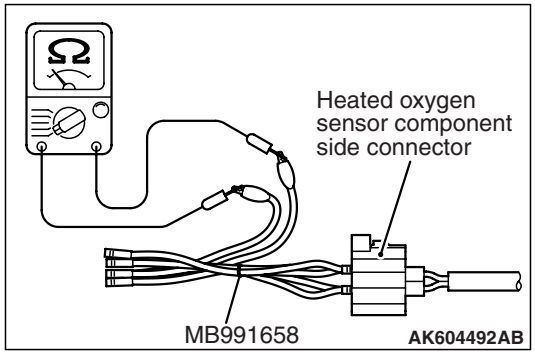
Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 2. Check the heated oxygen sensor (3rd).

(1) Disconnect heated oxygen sensor (3rd) connector D-31 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (3rd) side.
(2) Measure the resistance between heated oxygen sensor connector terminal No. 1 and terminal No. 2.

Standard value: 11 – 18 ohms [at 20° C (68° F)]

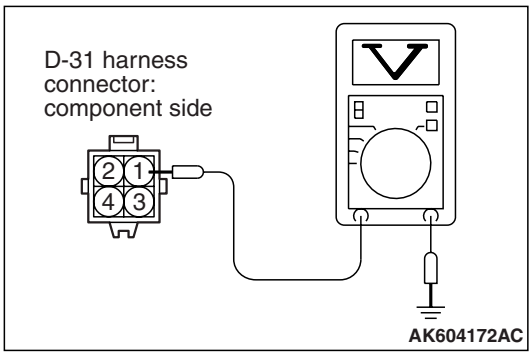


Q: Is the measured resistance between 11 and 18 ohms [at 20° C (68° F)]?

YES : Go to Step 3.
NO : Replace the heated oxygen sensor (3rd). Then go to Step 12.

STEP 3. Measure the power supply voltage at heated oxygen sensor (3rd) harness side connector D-31.

(1) Disconnect the connector D-31 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
  - Voltage should be battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check harness connector A-30X at the MFI relay for damage.

Q: Is the harness connector in good condition?

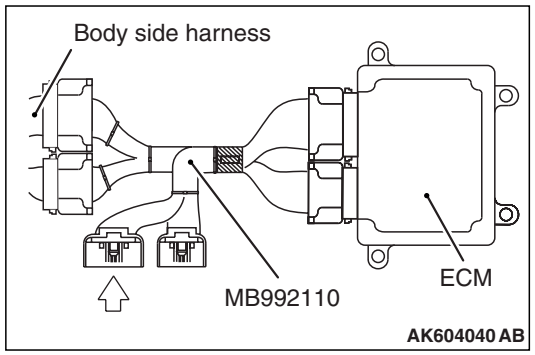
YES : Check harness connector C-38 and C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (3rd) connector D-31 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 12.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



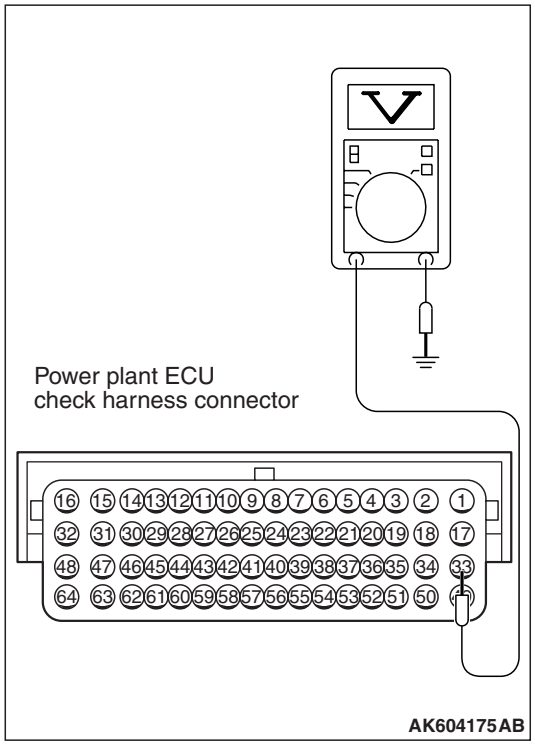
(3) Measure the voltage between terminal No. 33 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Go to Step 6.



STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check for open circuit or short circuit to ground between heated oxygen sensor (3rd) connector D-31 (terminal No. 2) and ECM connector B-108 (terminal No. 33).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and heated oxygen sensor (3rd) connector D-31 (terminal No. 1).

NOTE: Check harness after checking intermediate connector C-38 and C-39. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between heated oxygen sensor (3rd) connector D-31 (terminal No. 2) and ECM connector B-108 (terminal No. 33).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0043 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 12. Test the OBD-II drive cycle.

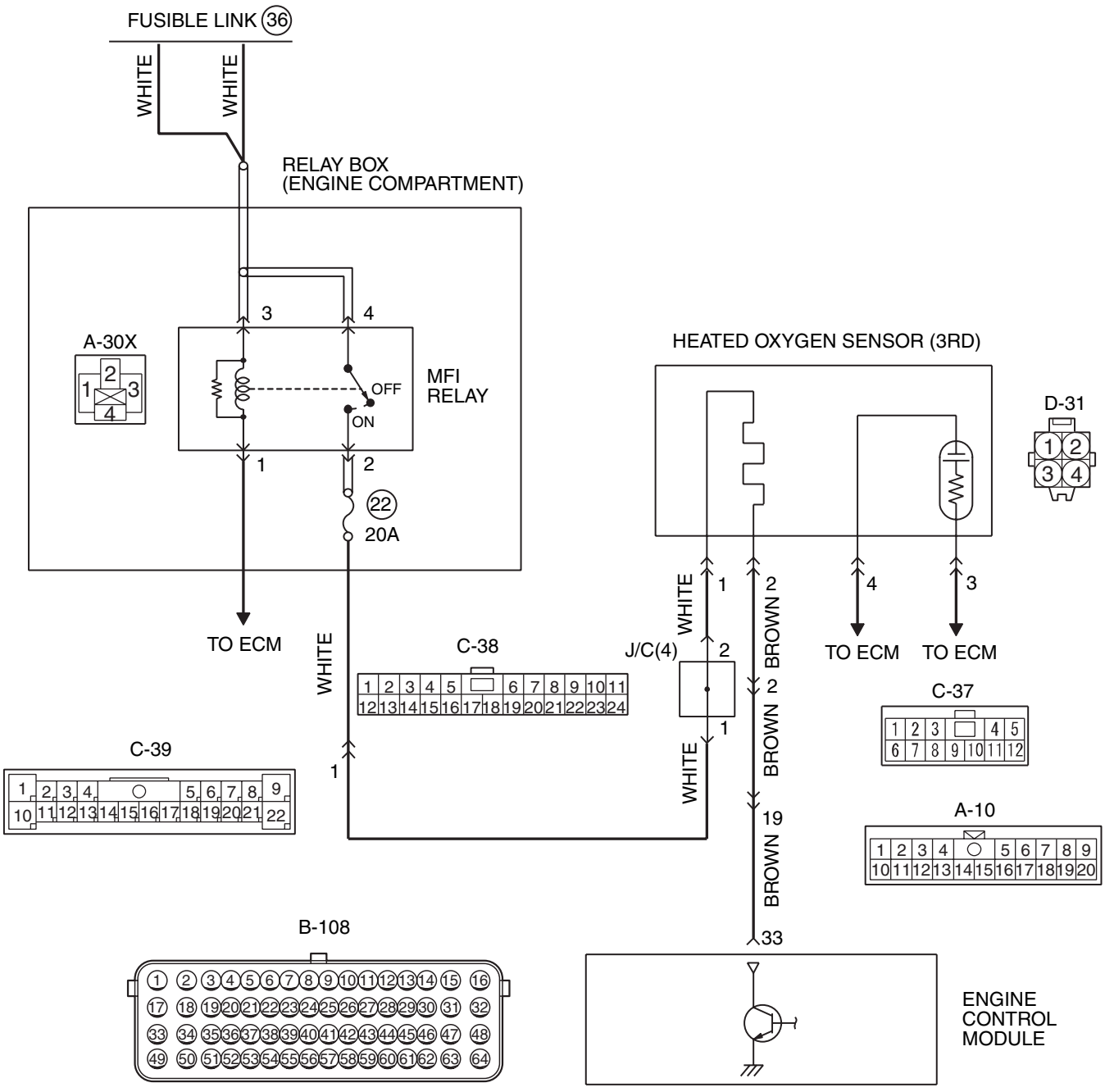
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0043 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0044: Heated Oxygen Sensor (3rd) Heater Control Circuit High <California>

HEATED OXYGEN SENSOR (3RD) HEATER CIRCUIT <CALIFORNIA>



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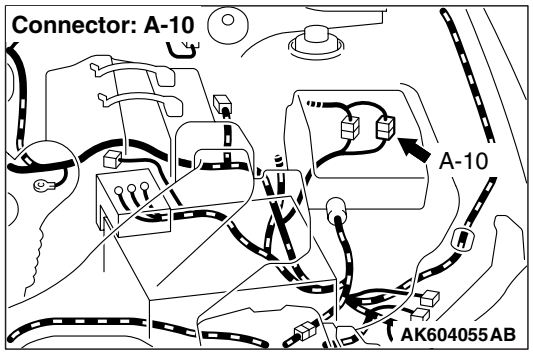
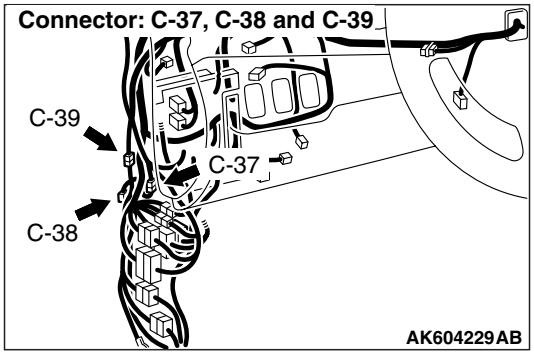
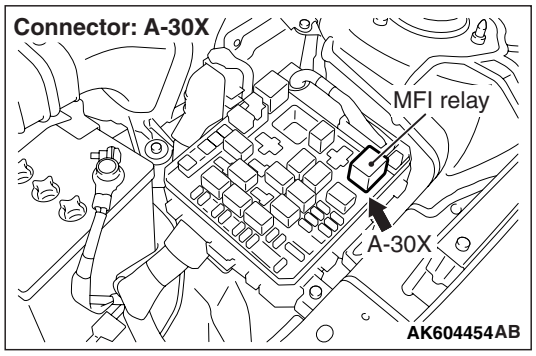
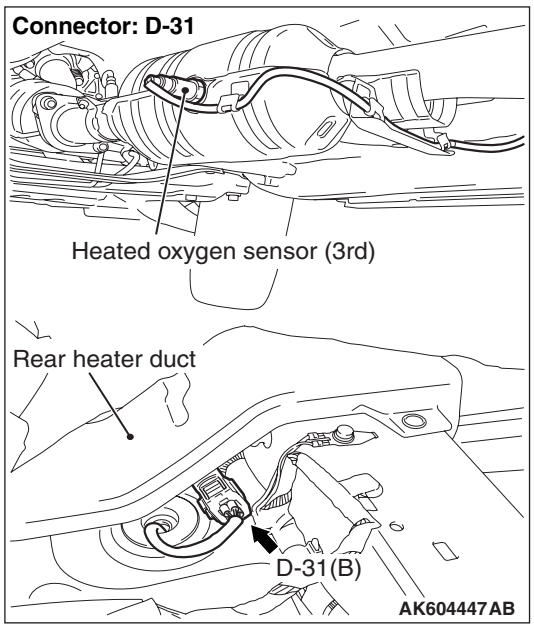
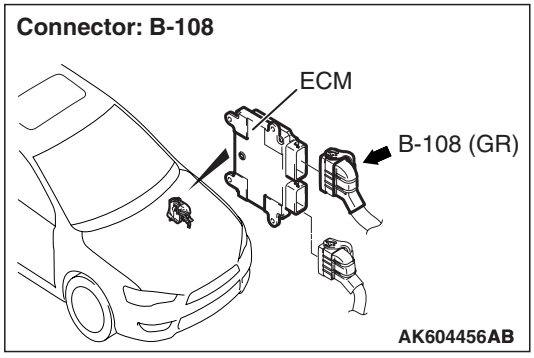










CIRCUIT OPERATION

- Power is supplied from the MFI relay (terminal No. 2) to the heated oxygen sensor (3rd) heater.
- The ECM (terminal No. 33) controls continuity to the heated oxygen sensor (3rd) heater by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The ECM checks whether the heater current is within a specified range when the heater is energized.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) heater current is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

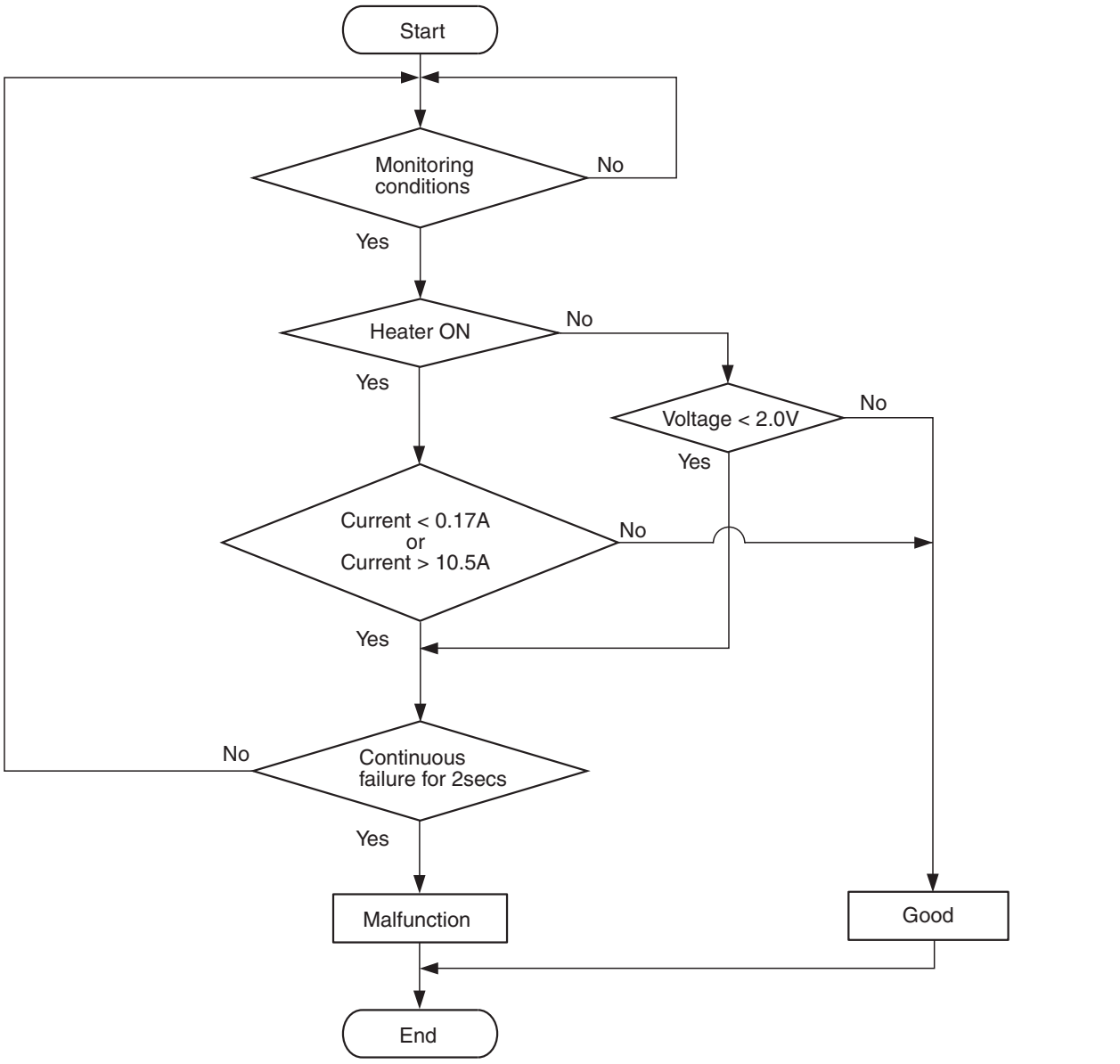
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- More than 2 seconds have passed since the engine starting sequence was completed.
- While the heated oxygen sensor (3rd) heater is on.
- Battery positive voltage is between 11 and 16.5 volts.

Judgement Criterion

- The heated oxygen sensor (3rd) heater current has continued to be higher than 10.5 ampere for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 2 P.13A-10.

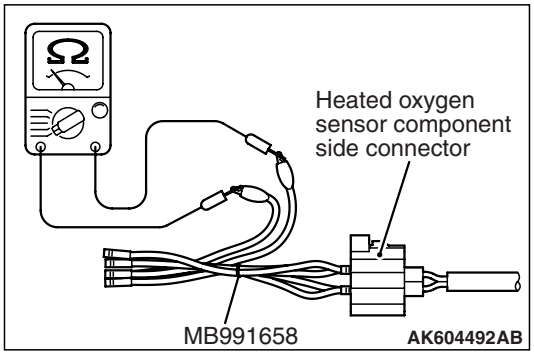
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (3rd) failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tool:
- MB991658: Test Harness



STEP 1. Check the heated oxygen sensor (3rd).

(1) Disconnect heated oxygen sensor (3rd) connector D-31 and connect test harness special tool, MB991658, to the connector on the heated oxygen sensor (3rd) side.

(2) Measure the resistance between heated oxygen sensor (3rd) connector terminal No. 1 and terminal No. 2.

Standard value: 11 –18 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 11 and 18 ohms [at 20° C (68° F)]?

YES : Go to Step 2.

NO : Replace the heated oxygen sensor (3rd). Then go to Step 3.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0044 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 2 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0044 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0069: Abnormal Correlation Between Manifold Absolute Pressure Sensor And Barometric Pressure Sensor

TECHNICAL DESCRIPTION

- The ECM detects abnormality in the sensor by comparing the manifold absolute pressure sensor output with the barometric pressure sensor output.

DESCRIPTIONS OF MONITOR METHODS

The ECM compares the manifold absolute pressure sensor output with the barometric pressure sensor output while the engine control relay is in "ON" position after the ignition switch is in "LOCK" (OFF) position. When the difference exceeds the specified value between them, the ECM determines whether the manifold absolute pressure sensor / the barometric pressure sensor has malfunction or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

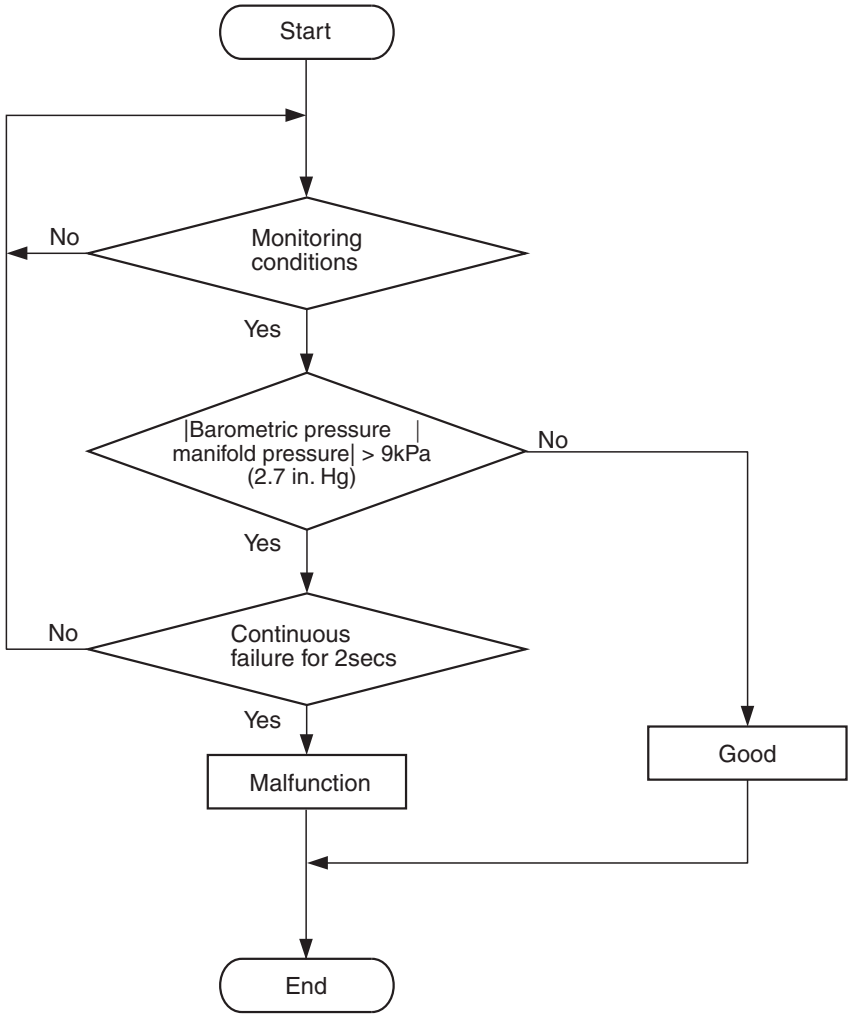
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604307

Check Conditions

- Ignition switch is in "LOCK" (OFF) position.
- After 2 seconds pass from the time when the engine is stopped.
- Engine coolant temperature is higher than 0° C (32° F).

Judgement Criterion

- Difference between manifold absolute pressure sensor output and barometric pressure sensor output is more than 9 kPa (2.7 in.Hg) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Barometric pressure sensor failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

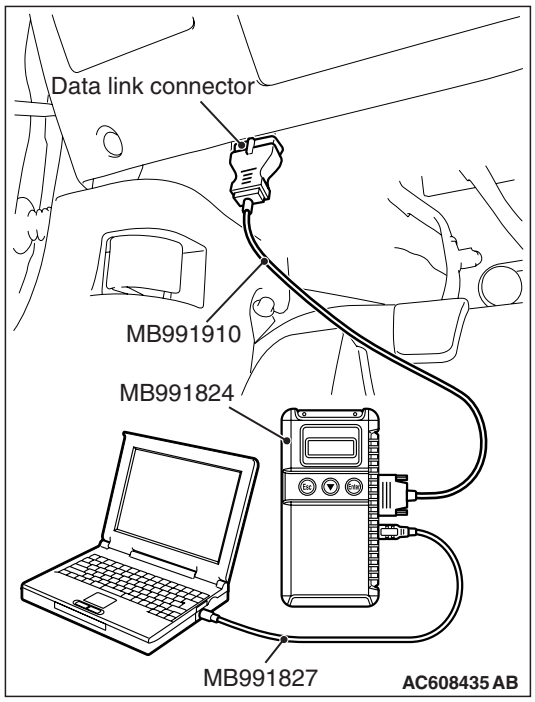
⚠ CAUTION

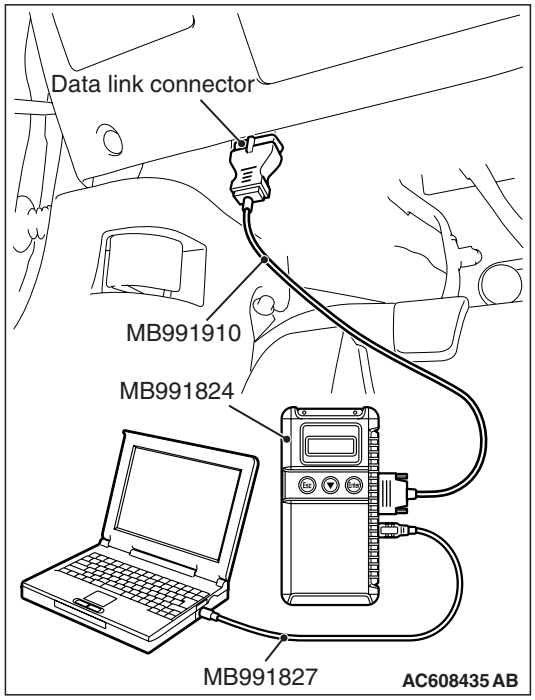
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0069 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.





STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

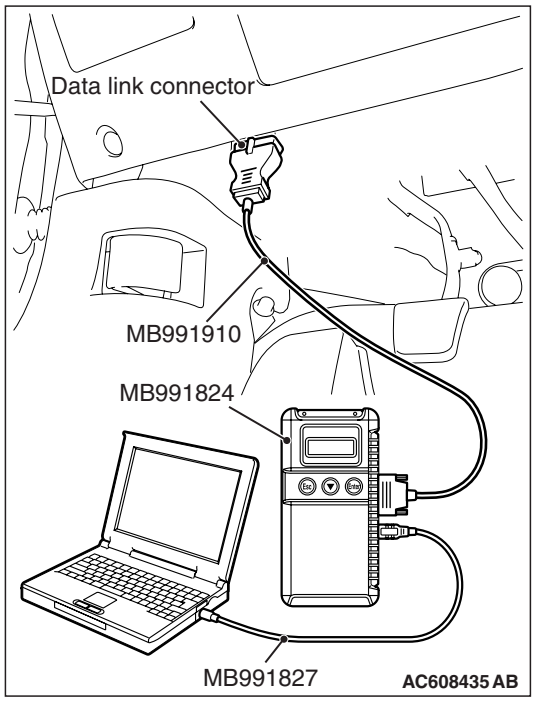
(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.

NO : Refer to, DTC P0106 –Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-149, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13A-158, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13A-166.



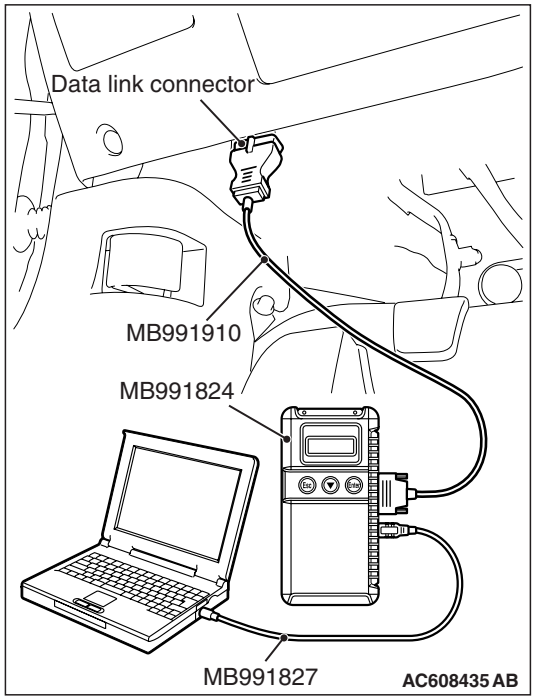
STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

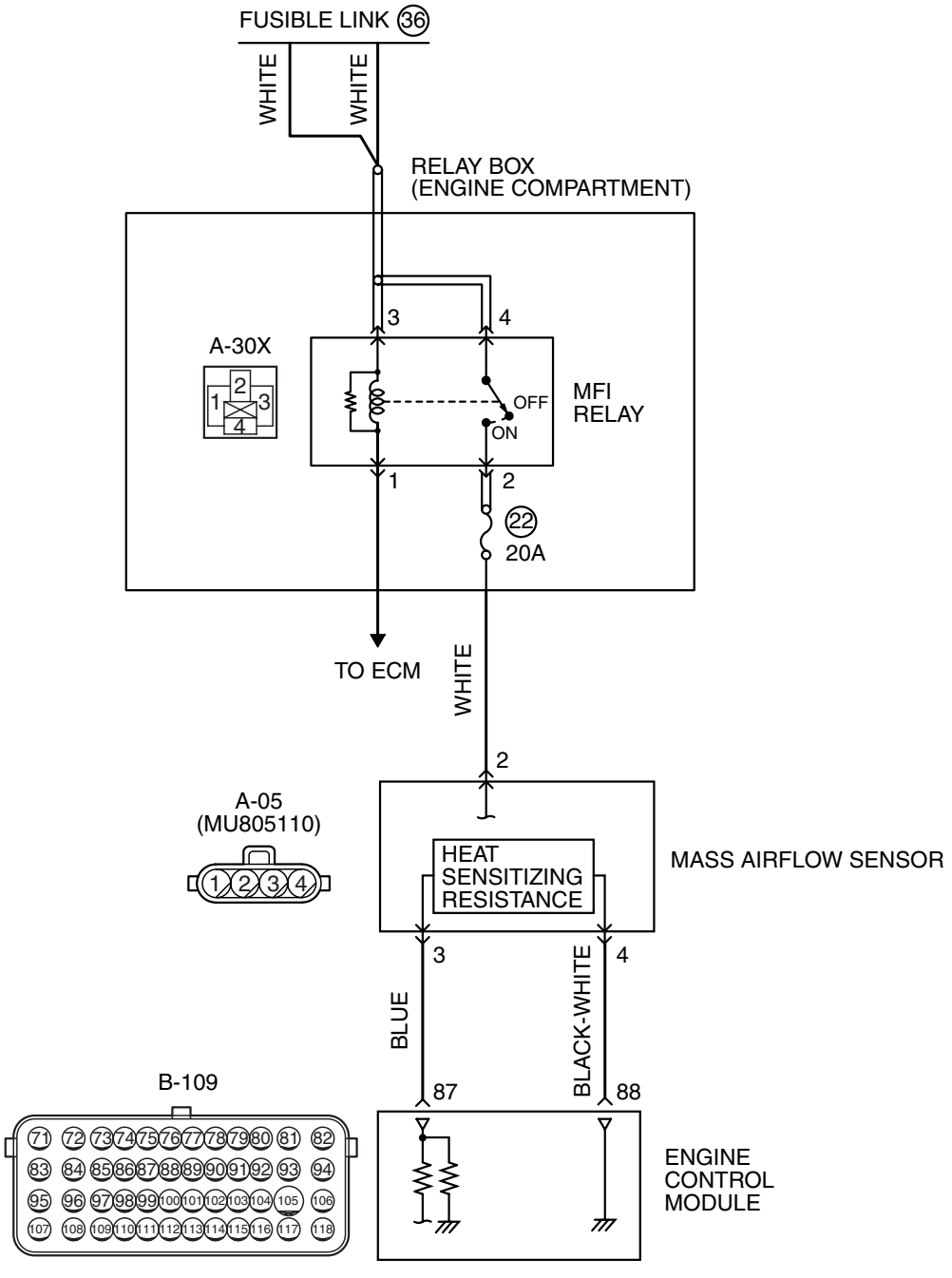
(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTC.
(3) Start the engine.
(4) Turn the ignition switch to "LOCK" (OFF) position and then wait 2 seconds.
(5) Turn the ignition switch to the "ON" position.
(6) Set scan tool MB991958, read the DTC.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0069 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0101: Mass Airflow Circuit Range/Performance Problem

MASS AIRFLOW SENSOR CIRCUIT



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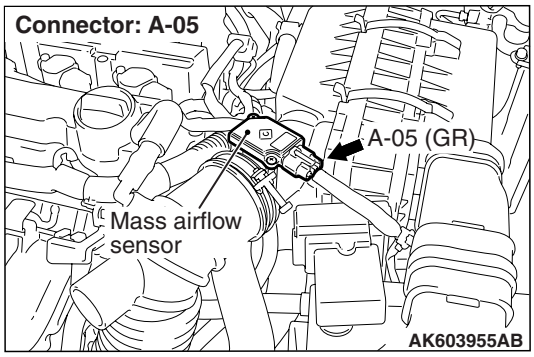
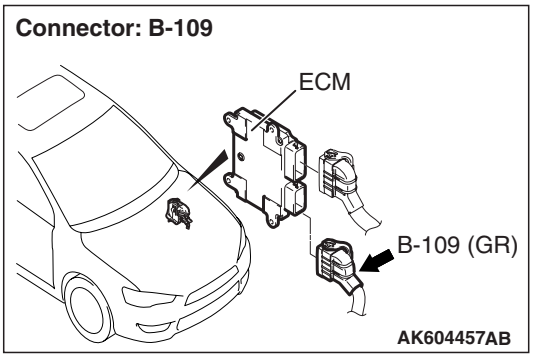
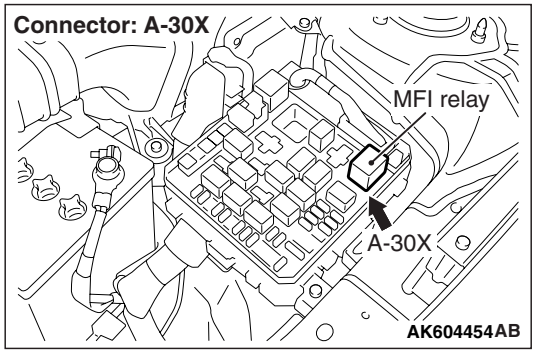






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 2), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs electric current which corresponds to the mass airflow rate.
- The ECM converts the electric current into the voltage and checks whether the voltage is within a specified range while the engine is running.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with mass airflow sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

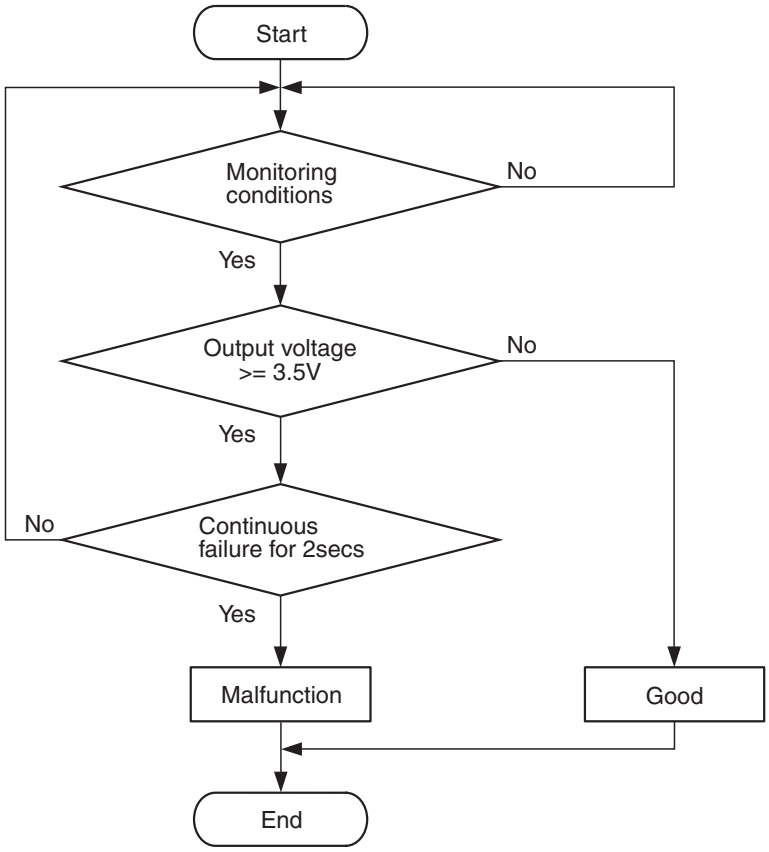
- Not applicable

Sensor (The sensor below is determined to be normal)

- Throttle position sensor

DTC SET CONDITIONS <Range/Performance problem –high>

Logic Flow Chart



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Check Conditions

- Throttle position sensor output voltage is 1.0 volt or lower.
- Mass airflow sensor output voltage is 4.9 volts (corresponding to an air flow rate of 340 g/sec) or lower .

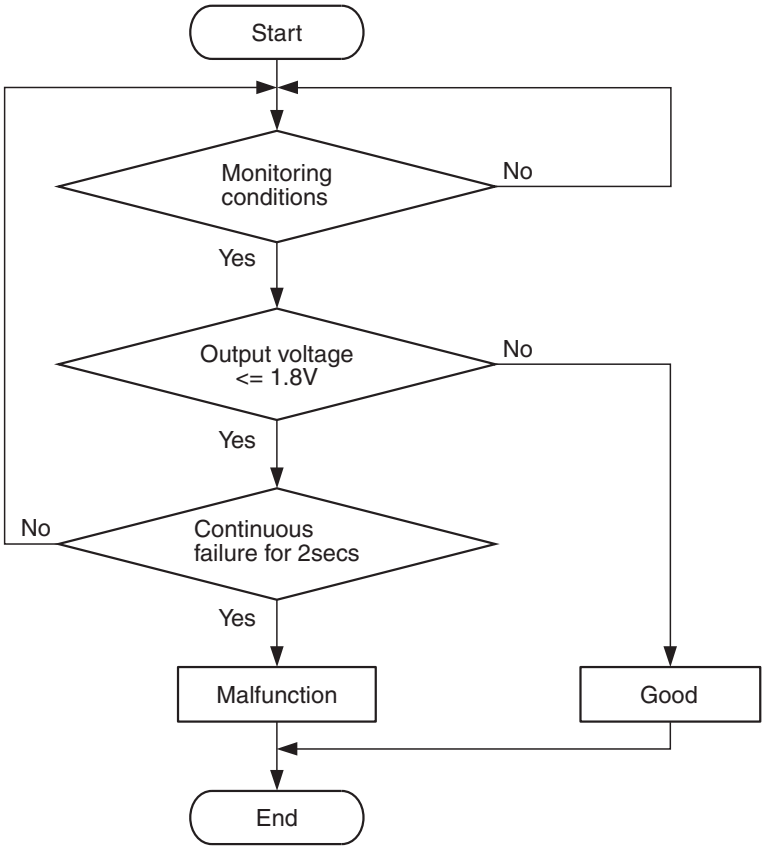
Judgement Criterion

- Mass airflow sensor output voltage has continued to be 3.5 volts (corresponding to an air flow rate of 105 g/sec) or higher for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem –low >

Logic Flow Chart



AK604309

Check Conditions

- Throttle position sensor output voltage is 1.5 volts or higher.
- Mass airflow sensor output voltage is 0.2 volt (corresponding to an air flow rate of 0 g/sec) or higher.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be 1.8 volts (corresponding to an air flow rate of 9 g/sec) or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Mass airflow sensor circuit harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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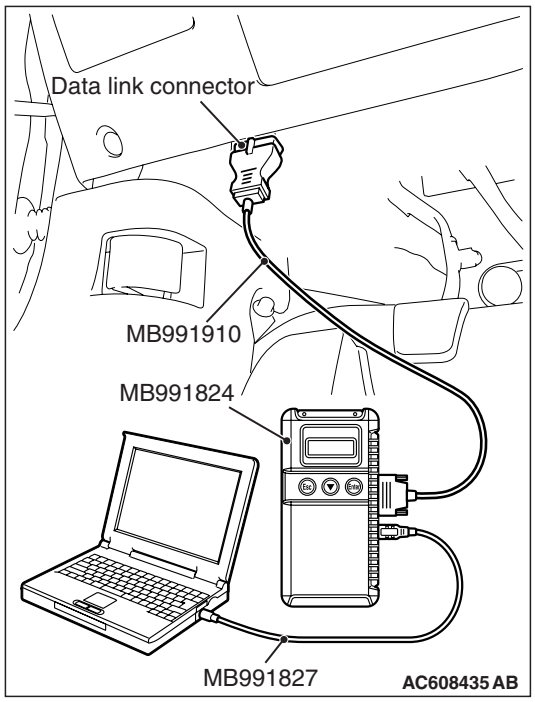


STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector A-05 at mass airflow sensor and harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 3. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and mass airflow sensor connector A-05 (terminal No. 2).

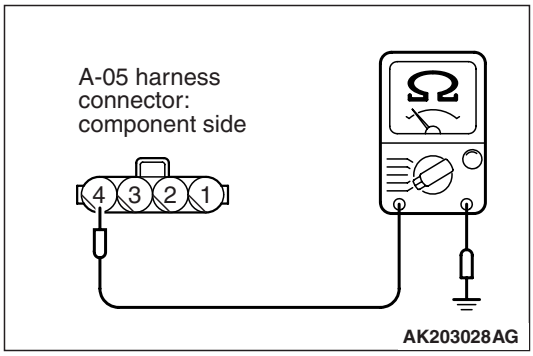
Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair it. Then go to Step 8.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 5. Check the continuity at mass airflow sensor harness side connector A-05.

(1) Disconnect the connector A-05 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 6.
NO : Repair harness wire between mass airflow sensor connector A-05 (terminal No. 4) and ECM connector B-109 (terminal No. 88) because of harness damage. Then go to Step 8.

STEP 6. Check for harness damage between mass airflow sensor connector A-05 (terminal No. 3) and ECM connector B-109 (terminal No. 87).

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0101 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

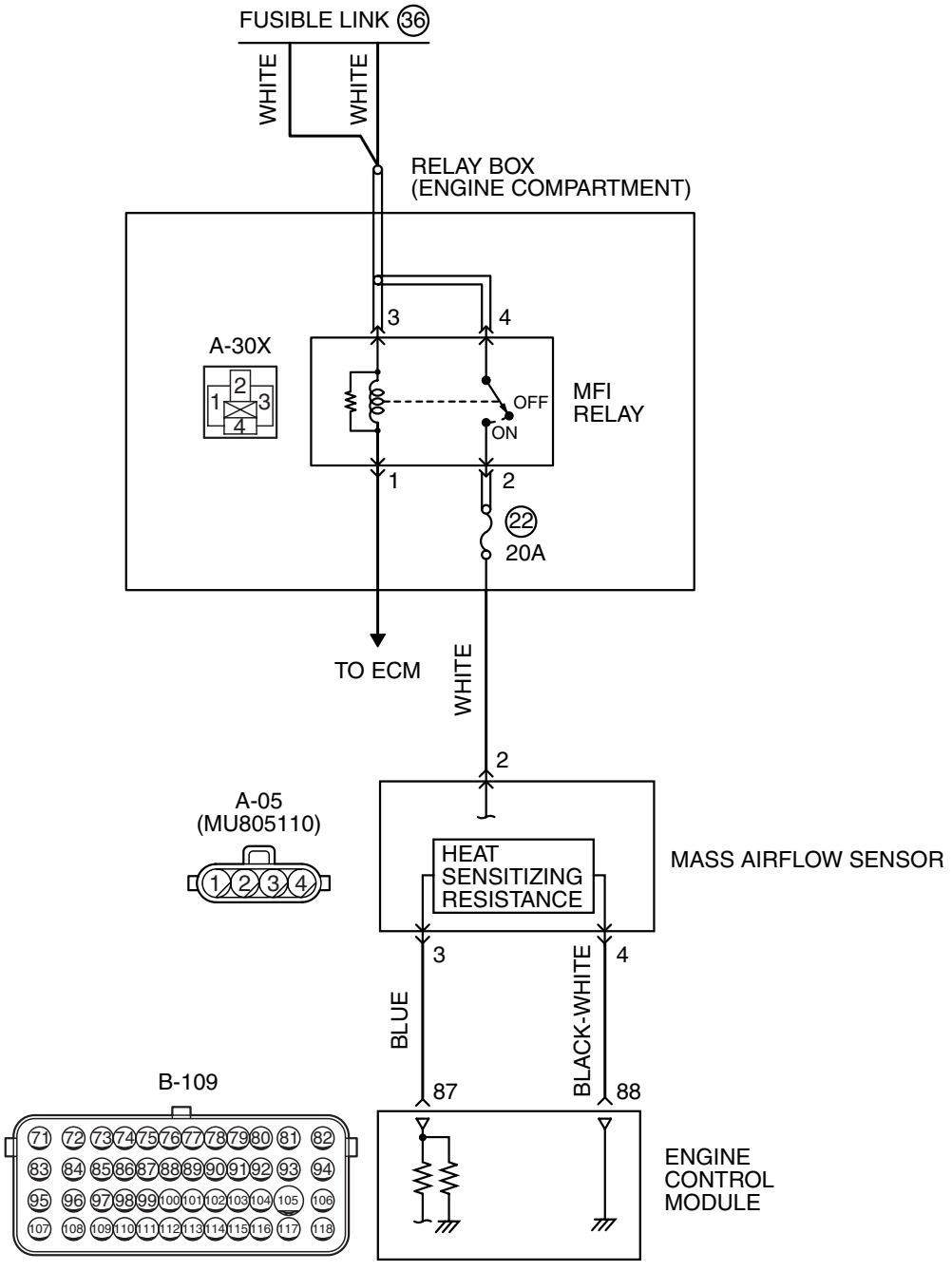
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0101 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0102: Mass Airflow Circuit Low Input

MASS AIRFLOW SENSOR CIRCUIT



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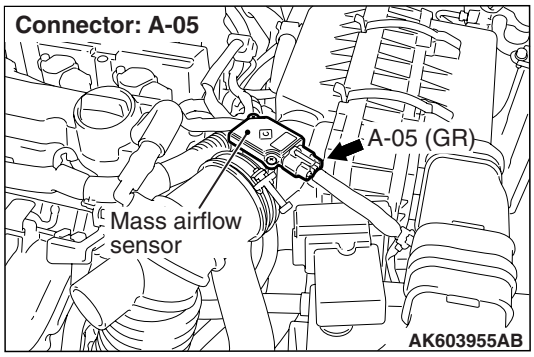
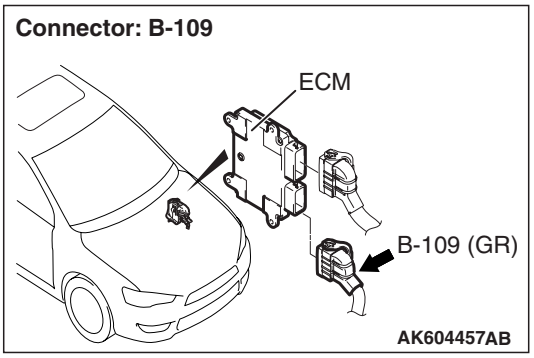
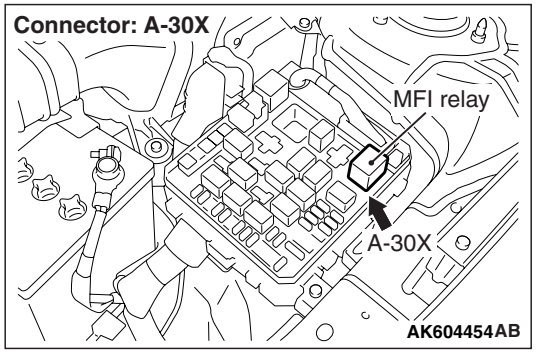






CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 2), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

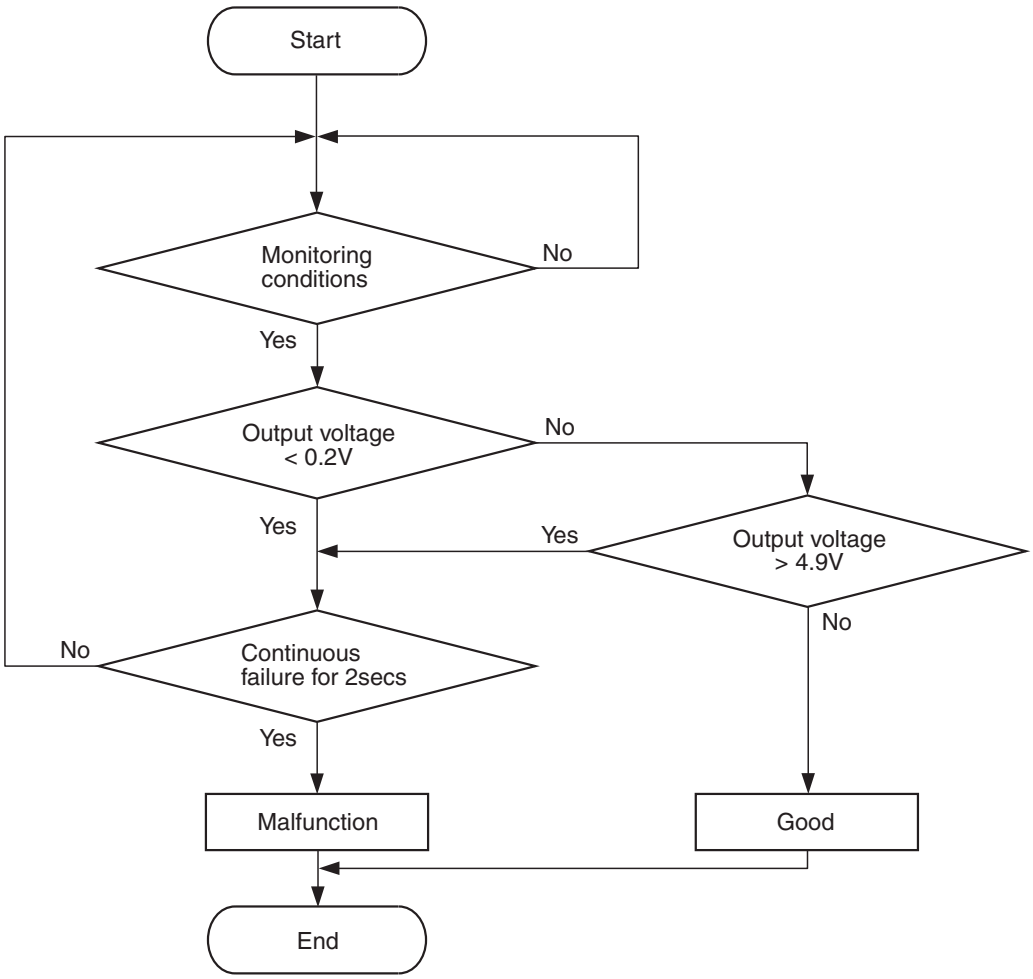
Sensor (The sensor below is determined to be normal)

- Not applicable

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK604310

Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be lower than 0.2 volt (corresponding to an air flow rate of 0 g/sec) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Open or shorted mass airflow sensor circuit, or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

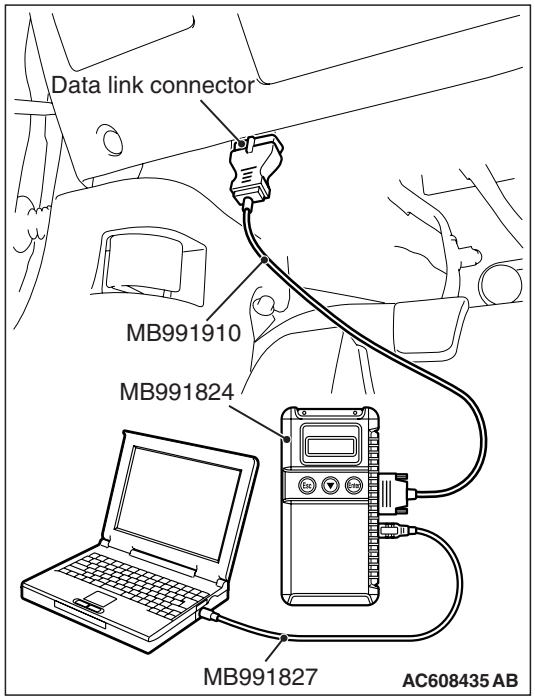
Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The standard value during idling should be between 1,350 and 1,670 millivolts.
  - When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

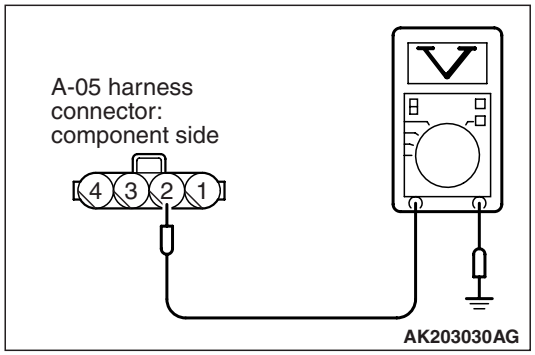
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector A-05 at mass airflow sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Measure the power supply voltage at mass airflow sensor harness side connector A-05.



(1) Disconnect the connector A-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
  - Voltage should be battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Go to Step 4.

TSB Revision

STEP 4. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and mass airflow sensor connector A-05 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

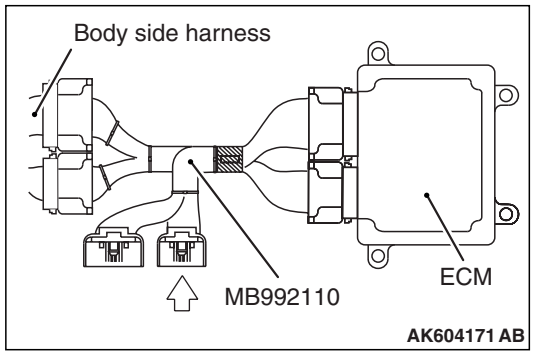
STEP 5. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

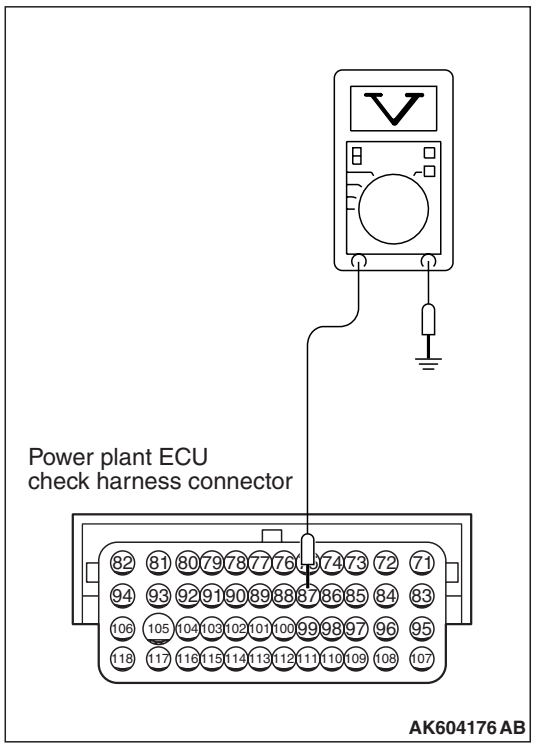
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Measure the sensor output voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Start the engine.



(3) Measure the voltage between terminal No. 87 and ground.
- When the engine is revved, voltage should be increase in response to revving.

Q: Is the measured voltage normal?

YES : Go to Step 9.
NO : Go to Step 7.

STEP 7. Check for open circuit or short circuit to ground between mass airflow sensor connector A-05 (terminal No. 3) and ECM connector B-109 (terminal No. 87).

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 10.

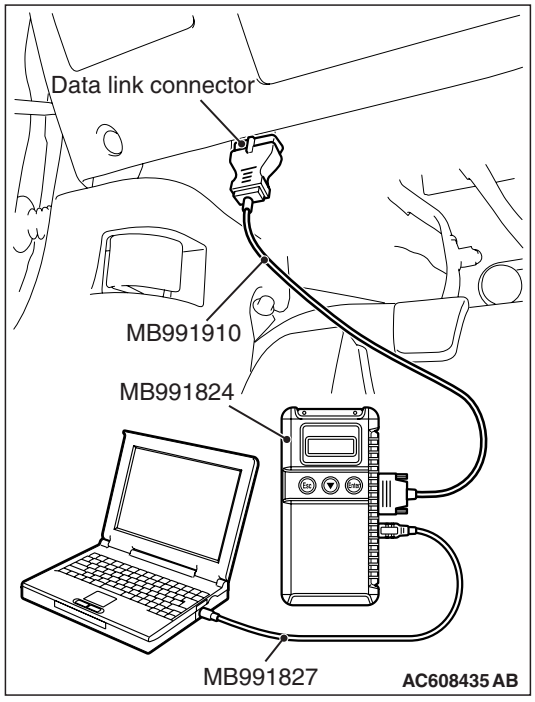
STEP 8. Replace the mass airflow sensor.

(1) Replace the mass airflow sensor.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.
NO : The inspection is complete.

STEP 9. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.



(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

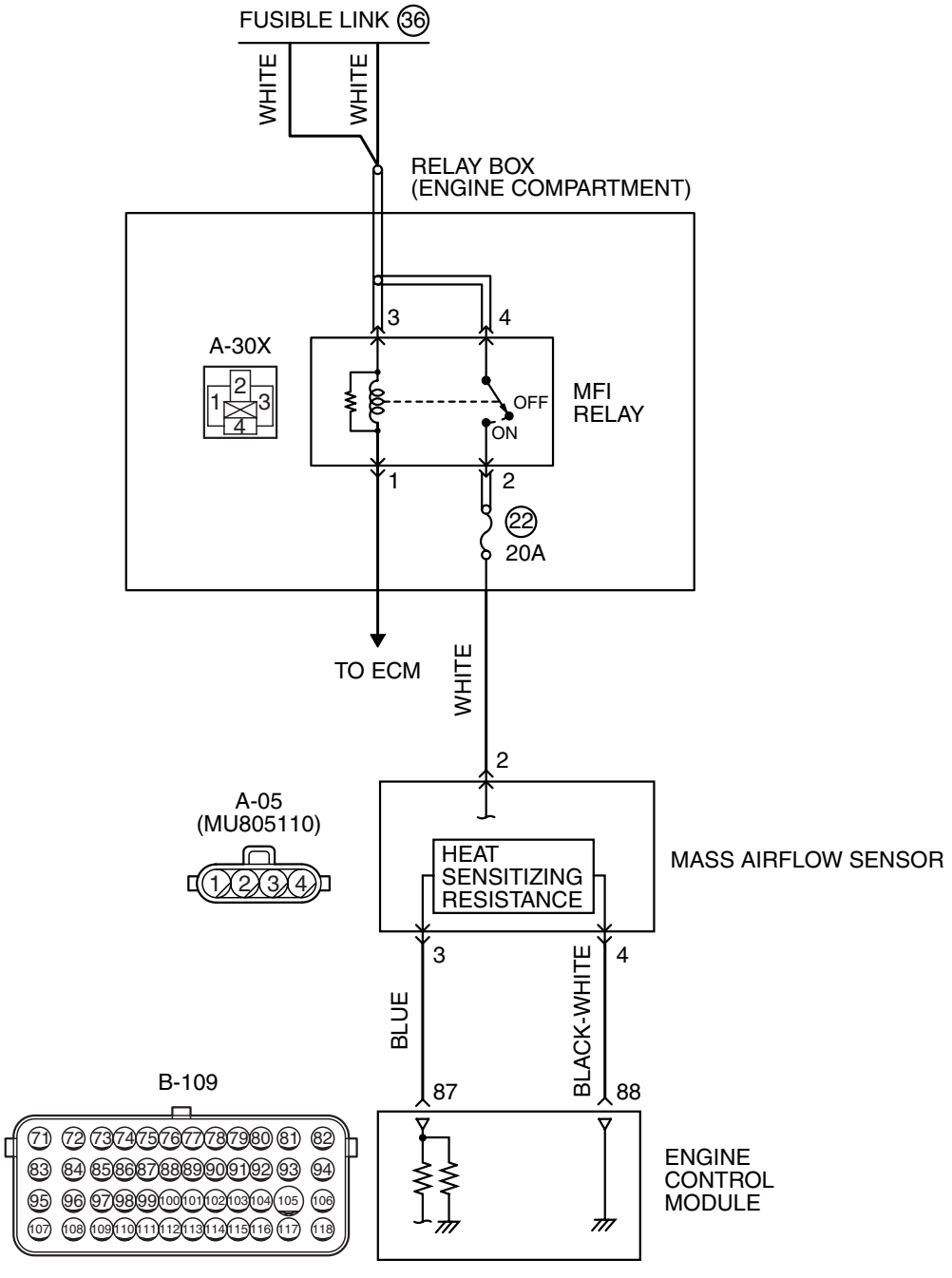
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0102 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0103: Mass Airflow Circuit High Input

MASS AIRFLOW SENSOR CIRCUIT



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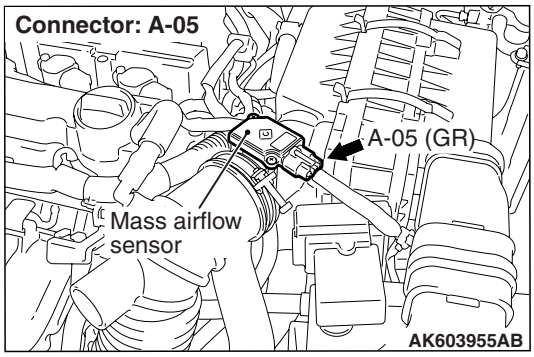

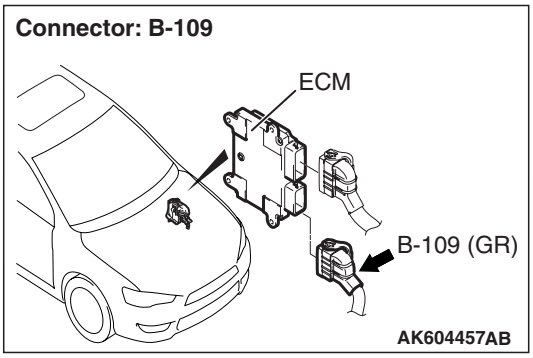

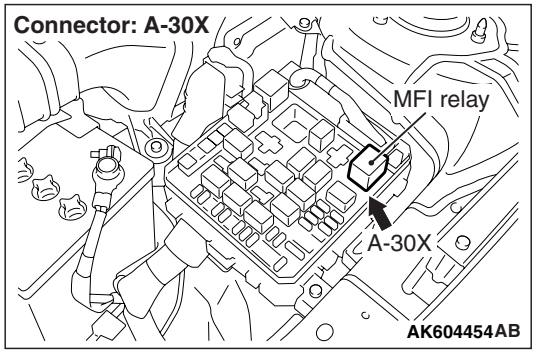

CIRCUIT OPERATION

- The mass airflow sensor power is supplied from the MFI relay (terminal No. 2), and the ground is provided on the ECM (terminal No. 88).
- A voltage that is according to the mass airflow rate is sent to the ECM (terminal No. 87) from the mass airflow sensor output terminal (terminal No. 3).

TECHNICAL DESCRIPTION

- While the engine is running, the mass airflow sensor outputs voltage which corresponds to the mass airflow rate.
- The ECM checks whether the voltage output by the mass airflow sensor while the engine is running is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Mass airflow sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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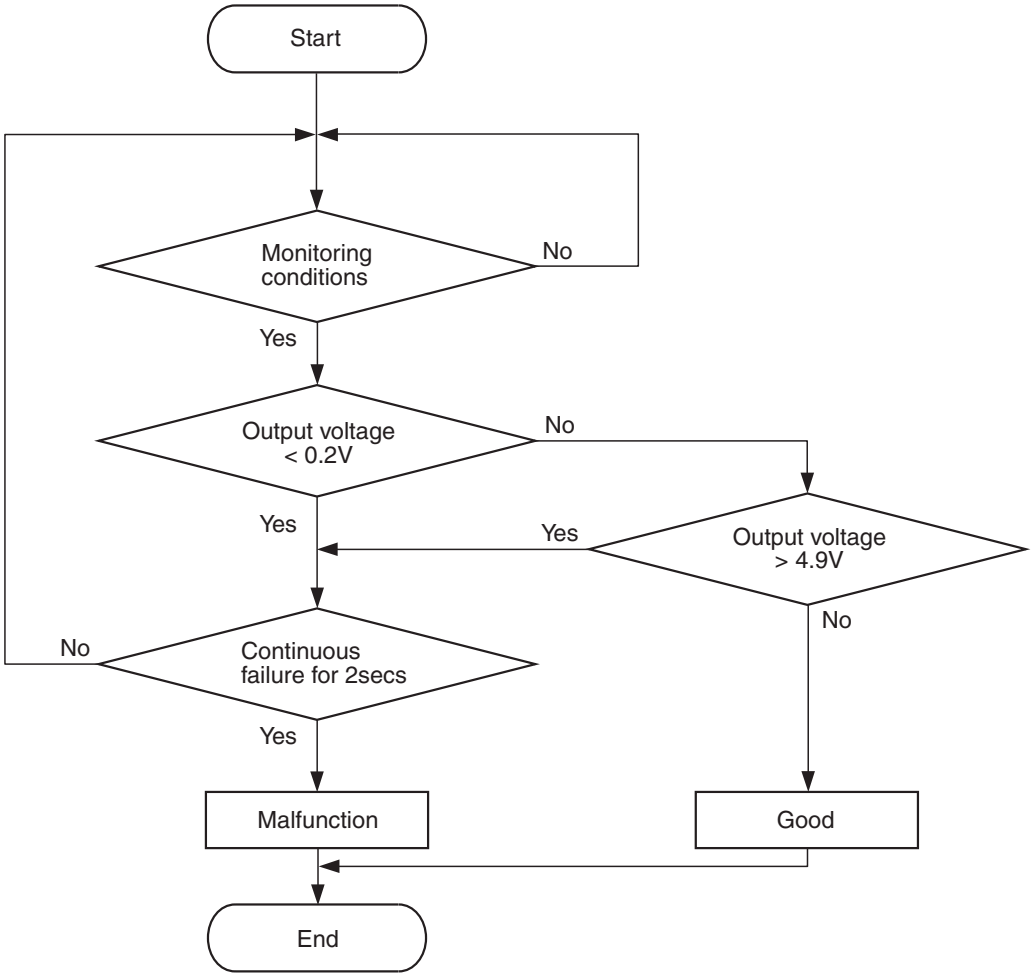
DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 3 seconds or more have passed since the ignition switch was turned to "ON" position.

Judgement Criterion

- Mass airflow sensor output voltage has continued to be higher than 4.9 volts (corresponding to an air flow rate of 340 g/sec) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Open mass airflow sensor circuit, or connector damage.
- ECM failed.

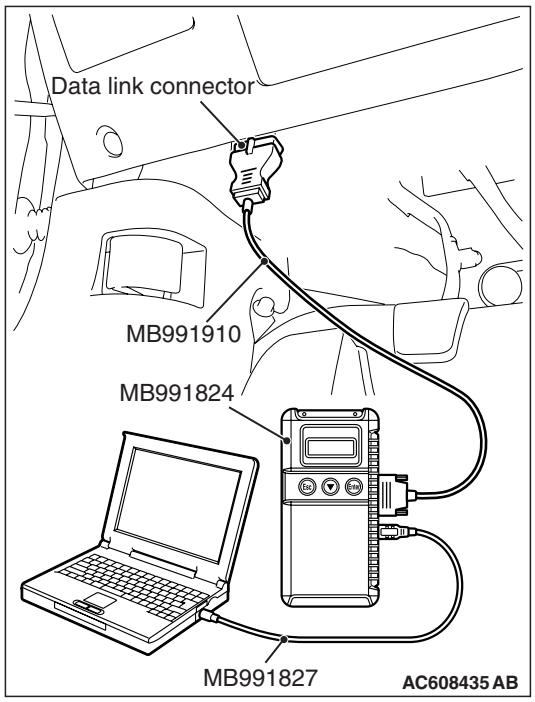
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The standard value during idling should be between 1,350 and 1,670 millivolts.
  - When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

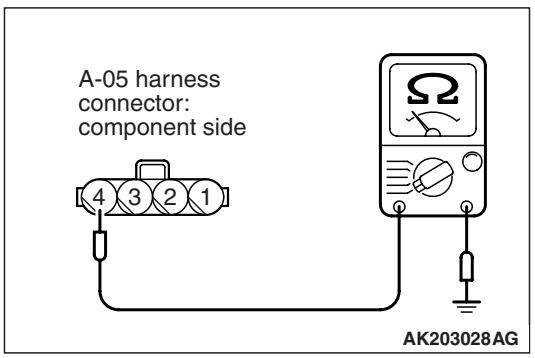
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector A-05 at mass airflow sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 3. Check the continuity at mass airflow sensor harness side connector A-05.



(1) Disconnect the connector A-05 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
  - Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 4.

TSB Revision

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Check for open circuit between mass airflow sensor connector A-05 (terminal No. 4) and ECM connector B-109 (terminal No. 88).

Q: Is the harness wire in good condition?

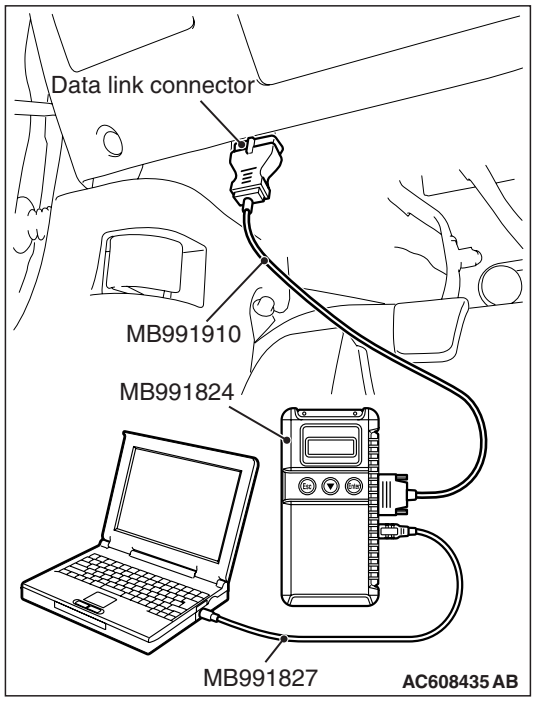
YES : Go to Step 6.

NO : Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

STEP 7. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the mass airflow sensor. Then go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

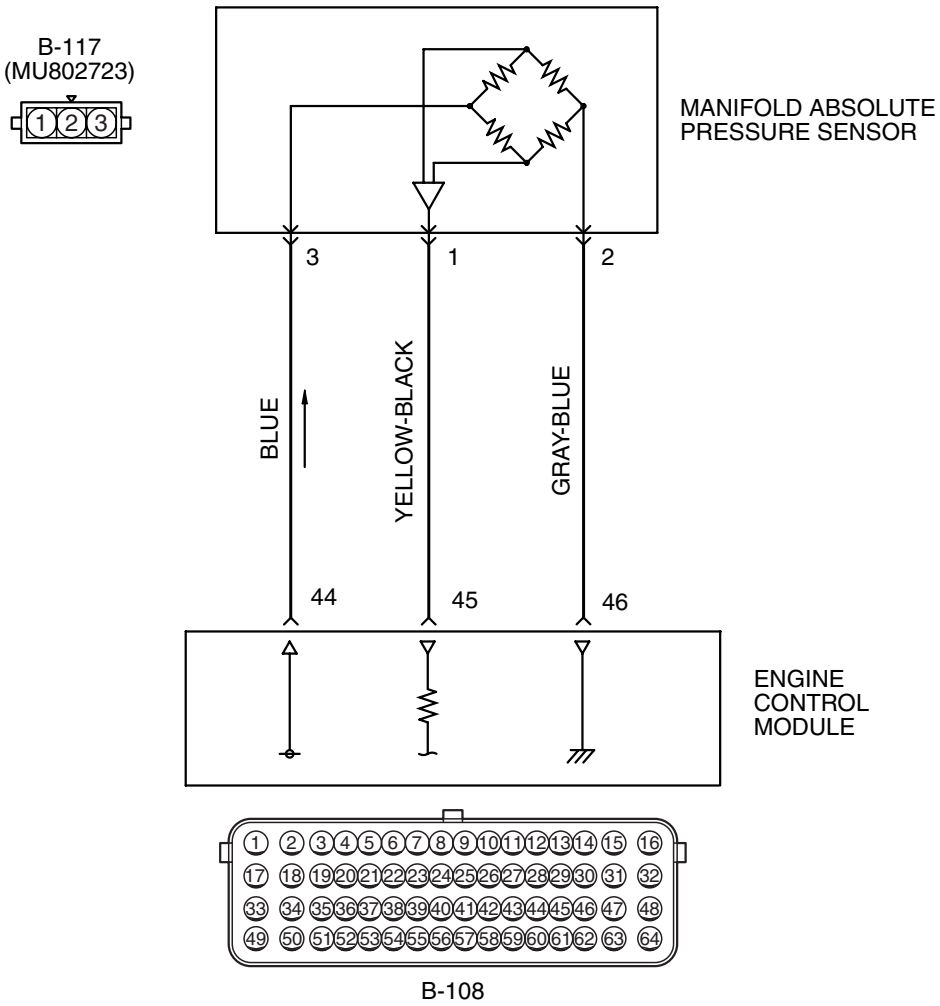
Q: Is DTC P0103 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0106: Manifold Absolute Pressure Circuit Range/Performance Problem

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



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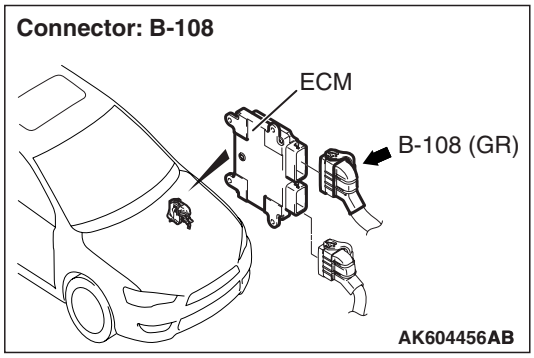
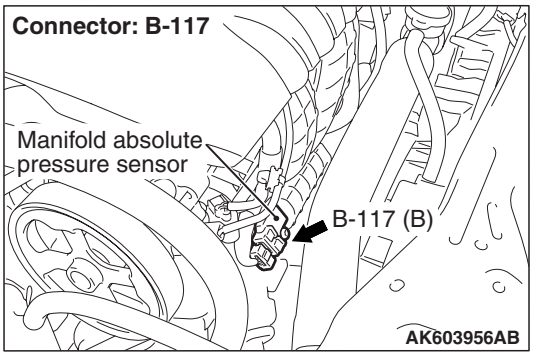




CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Compare load value with manifold absolute pressure sensor output voltage.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

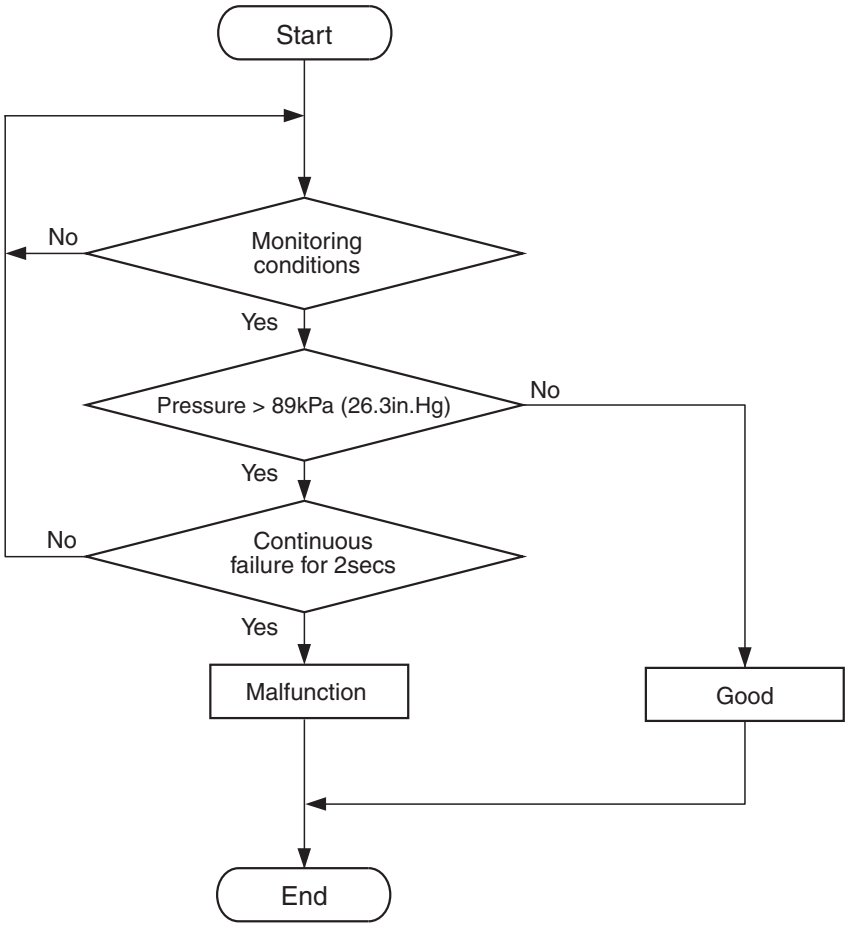
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS <Range/Performance problem –high input>

Logic Flow Chart



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Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Engine speed is 1,500 r/min or lower.
- Throttle position sensor output voltage is 0.8 volt or lower.

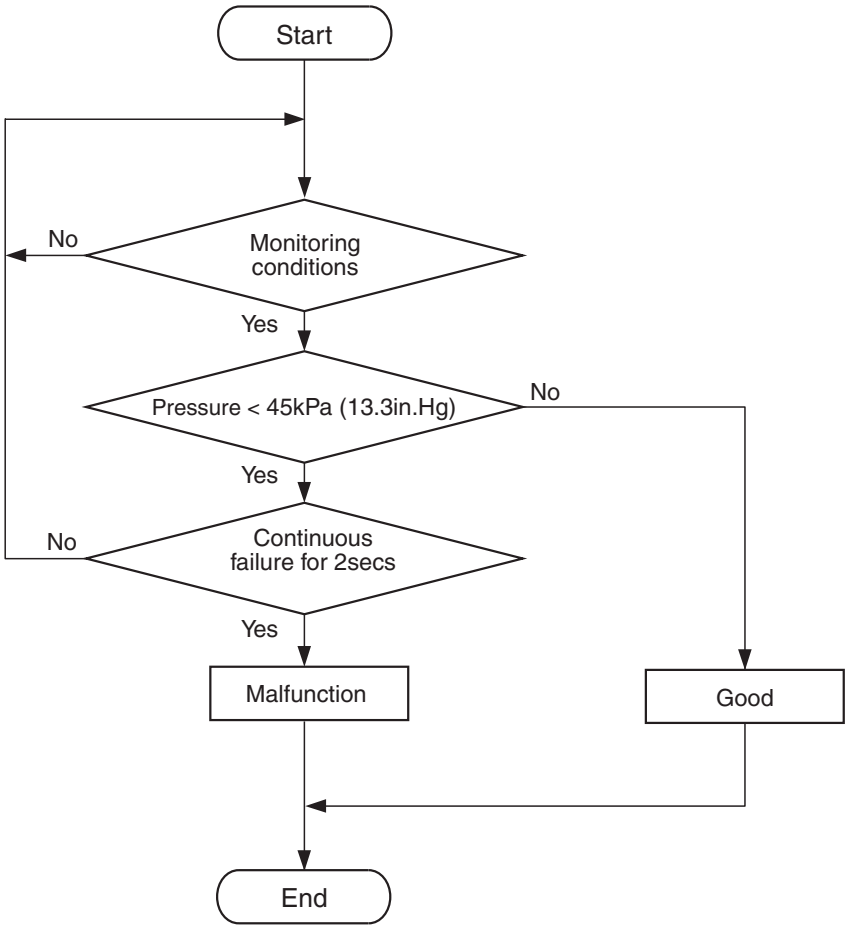
Judgement Criterion

- Manifold absolute pressure sensor output voltage has continued to be 3.5 volts [corresponding to a manifold absolute pressure of 89 kPa (26.3 in.Hg)] or higher for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem –low input>

Logic Flow Chart



AK604312

Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Engine speed is 1,500 r/min or higher.
- Throttle position sensor output voltage is 3.5 volts or higher.

Judgement Criterion

- Manifold absolute pressure sensor output voltage has continued to be 1.8 volts [corresponding to a manifold absolute pressure of 45 kPa (13.3 in.Hg)] or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Harness damage.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

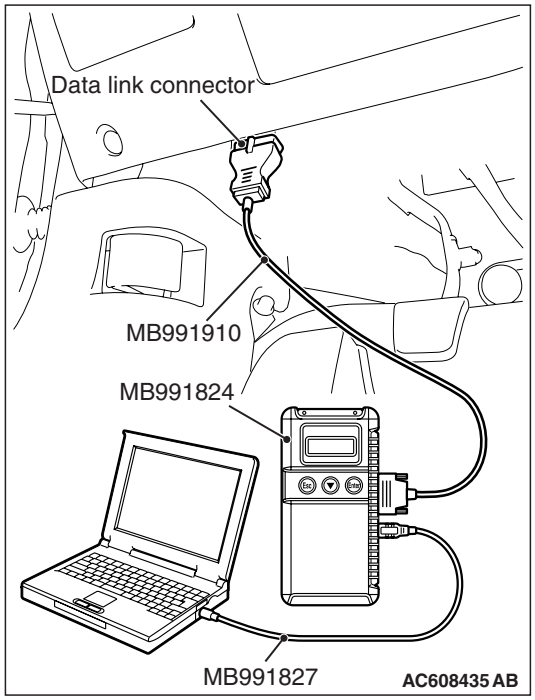
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

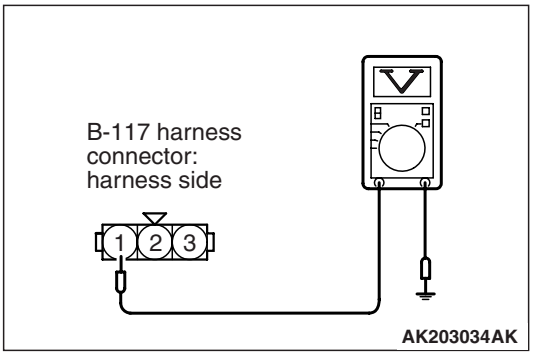


(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
(4) Start the engine.
  - When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.



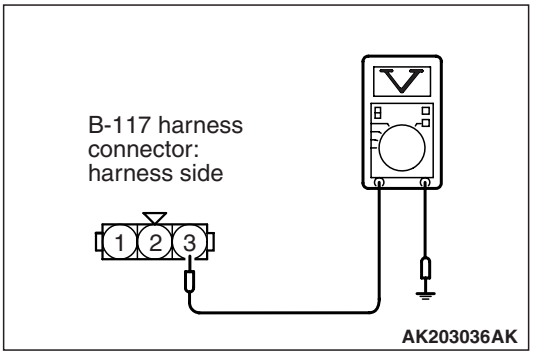
STEP 2. Measure the sensor output voltage at manifold absolute pressure sensor connector B-117 by backprobing.

(1) Do not disconnect the connector B-117.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : Go to Step 10.
NO : Go to Step 3.



STEP 3. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-117 by backprobing.

(1) Do not disconnect the connector B-117.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground by backprobing.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Check harness connector B-117 at the manifold absolute pressure sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 5. Check for harness damage between manifold absolute pressure sensor connector B-117 (terminal No. 3) and ECM connector B-108 (terminal No. 44).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 13.

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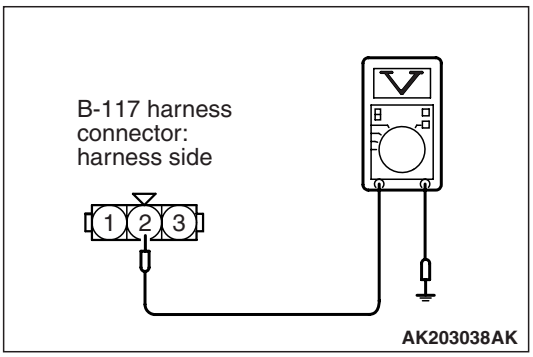


STEP 6. Measure the ground voltage at manifold absolute pressure sensor connector B-117 by backprobing.

(1) Do not disconnect the connector B-117.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
- Voltage should be 0.5 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 9.
NO : Go to Step 7.

STEP 7. Check harness connector B-117 at the manifold absolute pressure sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 8. Check for harness damage between manifold absolute pressure sensor connector B-117 (terminal No. 2) and ECM connector B-108 (terminal No. 46).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 13.

STEP 9. Check harness connector B-117 at manifold absolute pressure sensor for damage.

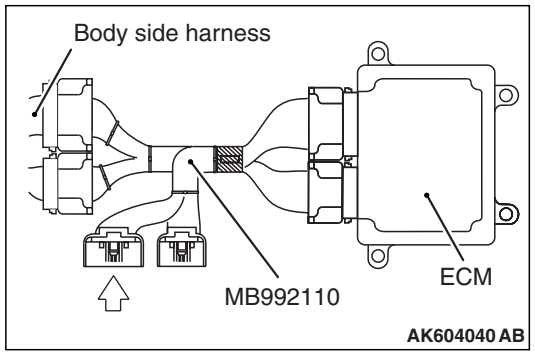
Q: Is the harness connector in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 13.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 10. Check harness connector B-117 at the manifold absolute pressure sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

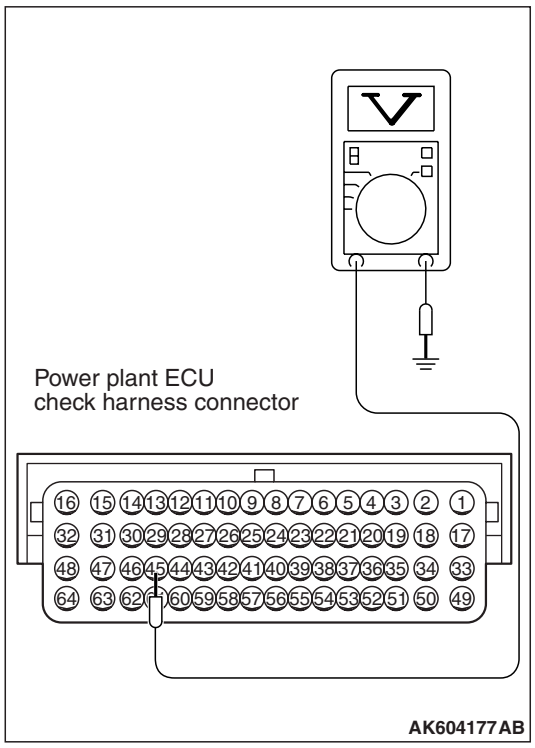
YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 11. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



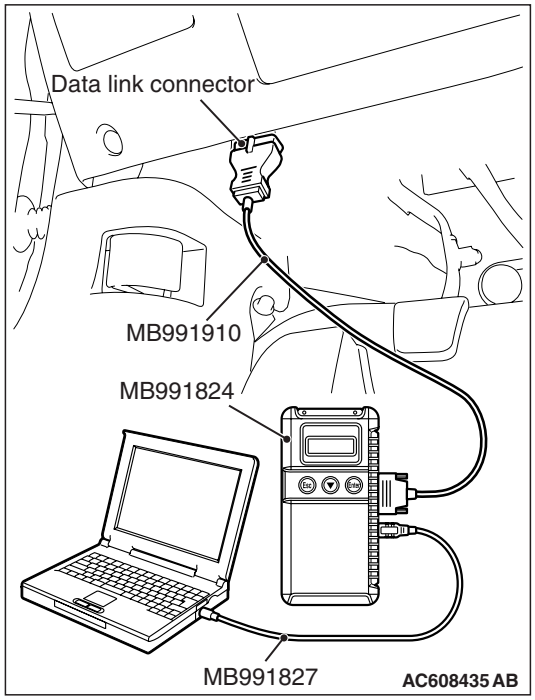
(3) Measure the voltage between terminal No. 45 and ground.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : Go to Step 12.

NO : Repair harness wire between manifold absolute pressure sensor connector B-117 (terminal No. 1) and ECM connector B-108 (terminal No. 45) because of harness damage. Then go to Step 13.



STEP 12. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 13.

STEP 13. Test the OBD-II drive cycle.

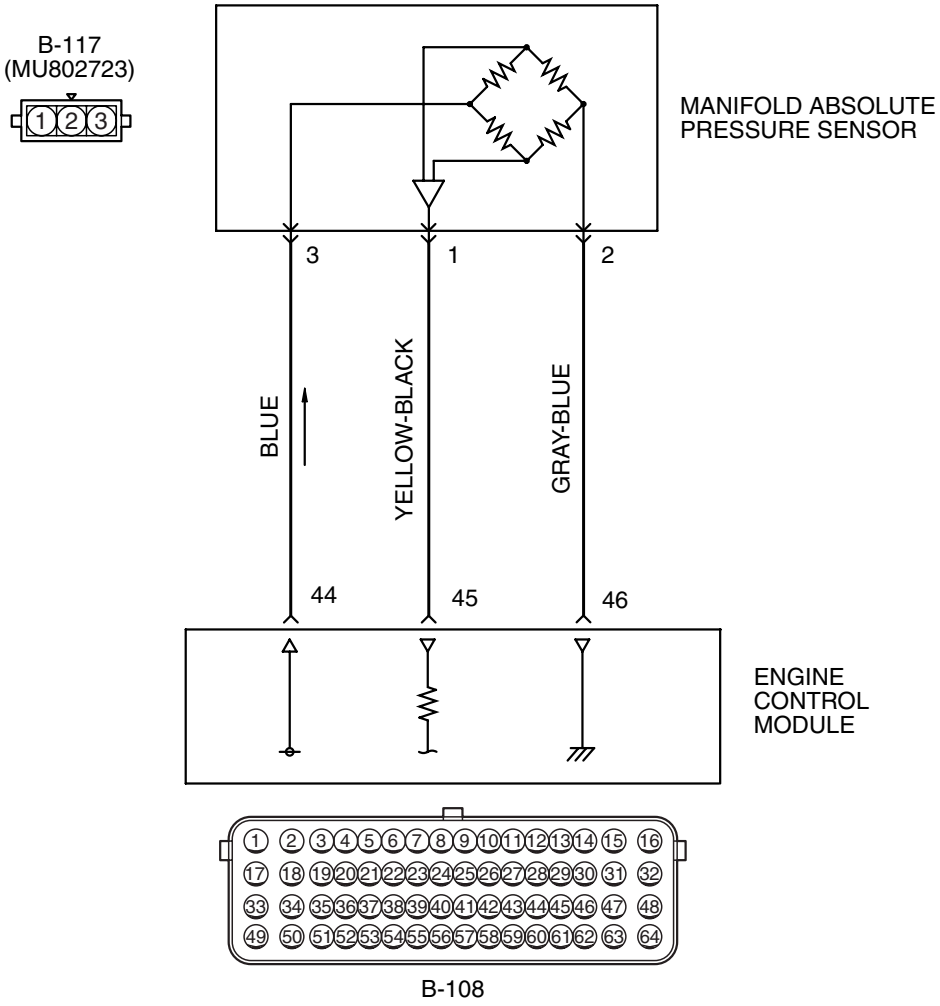
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0106 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0107: Manifold Absolute Pressure Circuit Low Input

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



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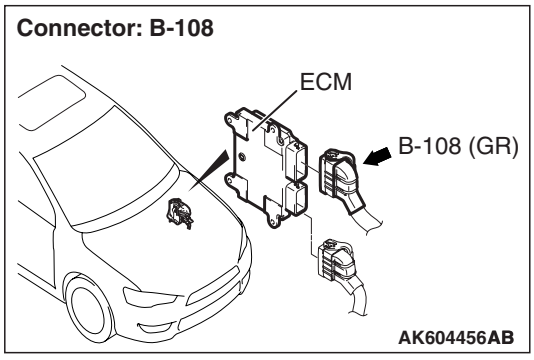
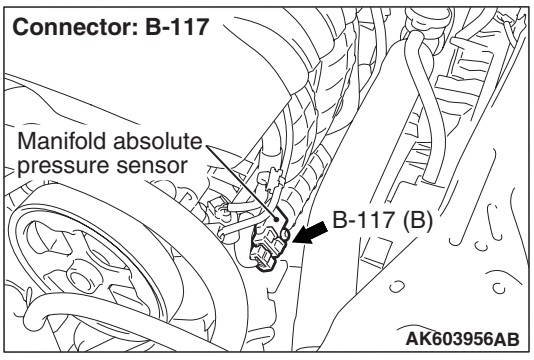




TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from the ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

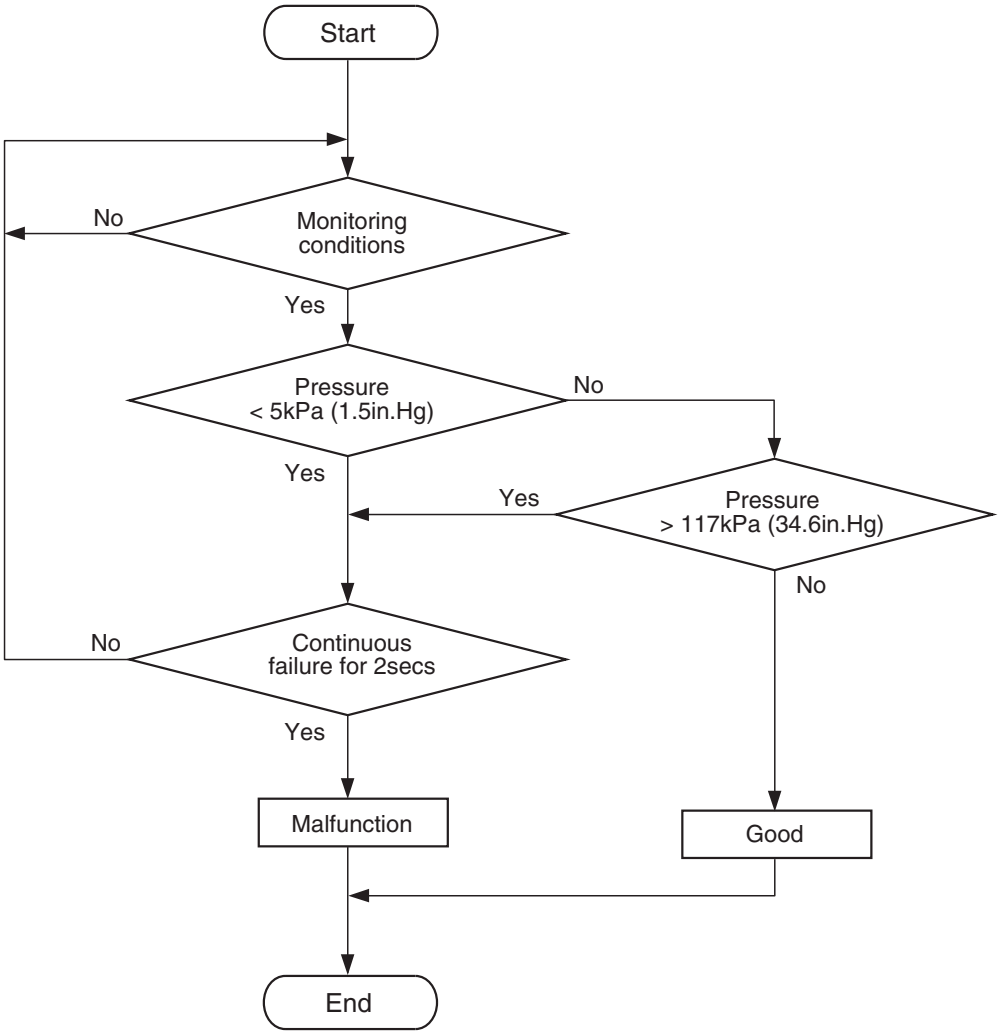
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.
- Volumetric efficiency is higher than 20 percent.

Judgement Criterion

- Manifold absolute pressure sensor output voltage has continued to be 0.2 volt [corresponding to a manifold absolute pressure of 5 kPa (1.5 in.Hg)] or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 7 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

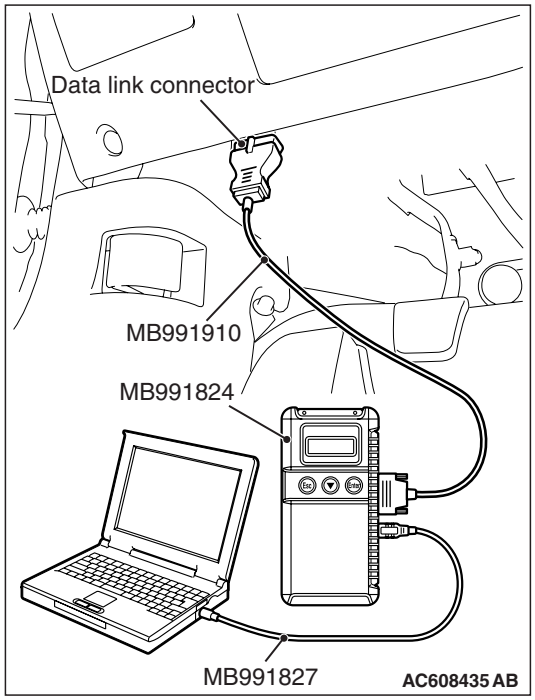
- Manifold absolute pressure sensor failed.
- Open or shorted manifold absolute pressure sensor circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



⚠ CAUTION

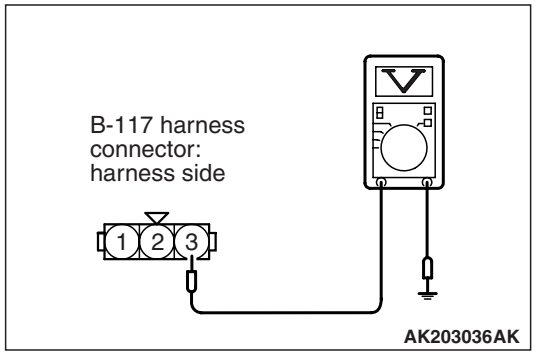
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
(4) Start the engine.
  - When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor supply voltage at manifold absolute pressure sensor connector B-117 by backprobing.



(1) Do not disconnect the connector B-117.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground by backprobing.
  - Voltage should be between 4.9 and 5.1 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 8.
NO : Go to Step 3.

TSB Revision

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

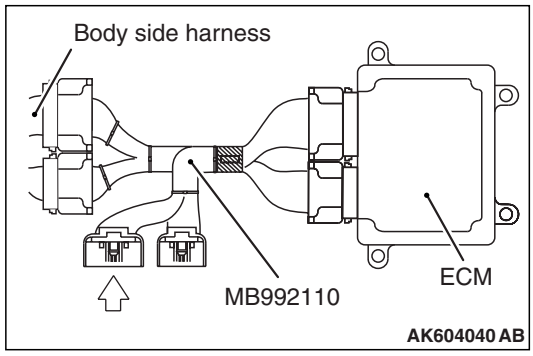
YES : Go to Step 4.

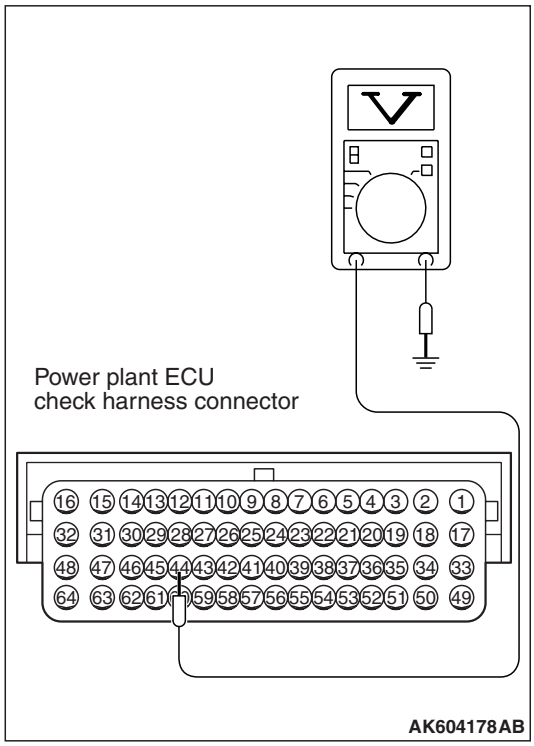
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 4. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 44 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.

NO : Go to Step 5.

STEP 5. Check harness connector B-117 at the manifold absolute pressure sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 6. Check for short circuit to ground between manifold absolute pressure sensor connector B-117 (terminal No. 3) and ECM connector B-108 (terminal No. 44).

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 7. Check harness connector B-117 at the manifold absolute pressure sensor for damage.

Q: Is the connector in good condition?

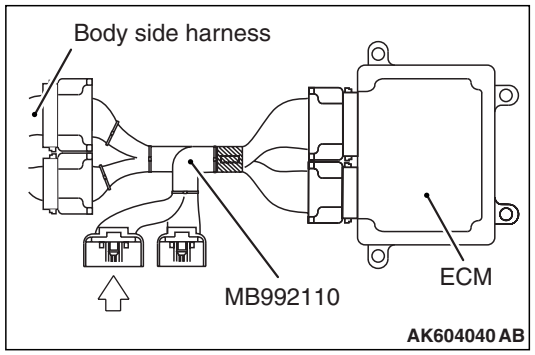
YES : Repair harness wire between manifold absolute pressure sensor connector B-117 (terminal No. 3) and ECM connector B-108 (terminal No. 44) because of open circuit. Then go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 8. Check harness connector B-117 at the manifold absolute pressure sensor and connector B-108 at ECM for damage.

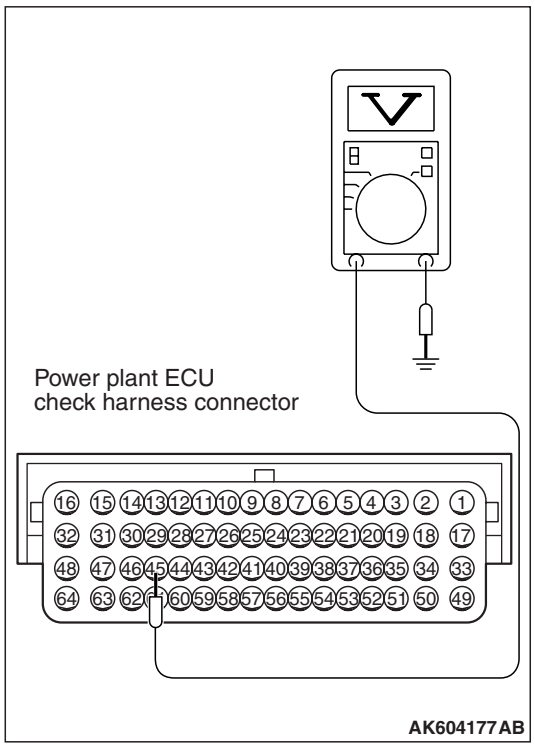
Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 45 and ground.
- When altitude is 0 m (0 foot), voltage should be between 3.8 and 4.2 volts.
- When altitude is 600 m (1,969 feet), voltage should be between 3.5 and 3.9 volts.
- When altitude is 1,200 m (3,937 feet), voltage should be between 3.3 and 3.7 volts.
- When altitude is 1,800 m (5,906 feet), voltage should be between 3.0 and 3.4 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

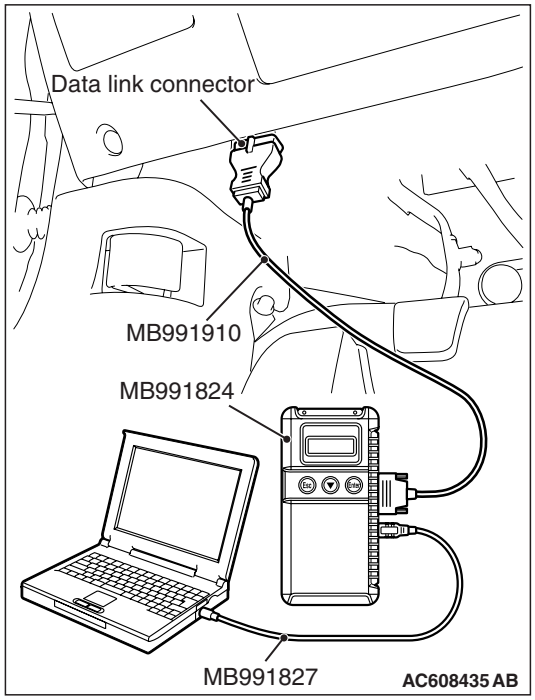
Q: Is the measured voltage normal?

YES : Go to Step 11.
NO : Go to Step 10.

STEP 10. Check for open or short circuit to ground between manifold absolute pressure sensor connector B-117 (terminal No. 1) and ECM connector B-108 (terminal No. 45).

Q: Is the harness wire in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 12.
NO : Repair it. Then go to Step 12.



STEP 11. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

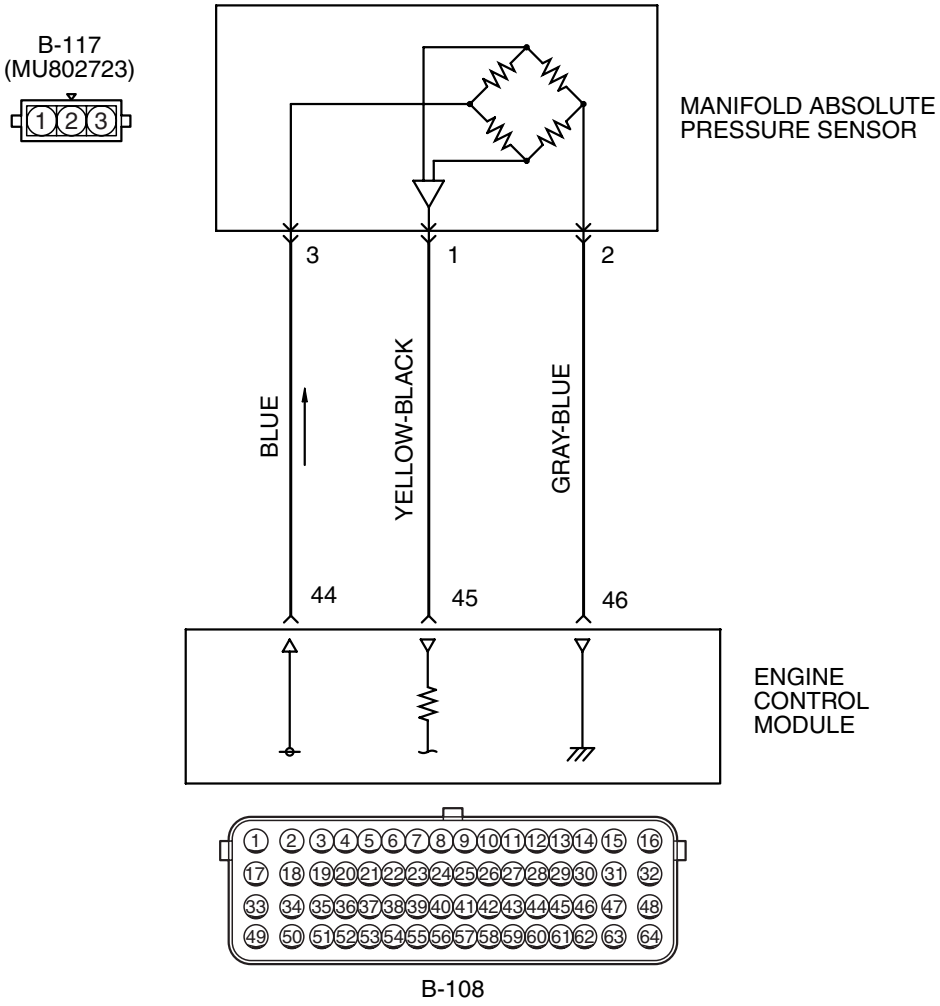
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 7 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0107 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0108: Manifold Absolute Pressure Circuit High Input

MANIFOLD ABSOLUTE PRESSURE SENSOR CIRCUIT



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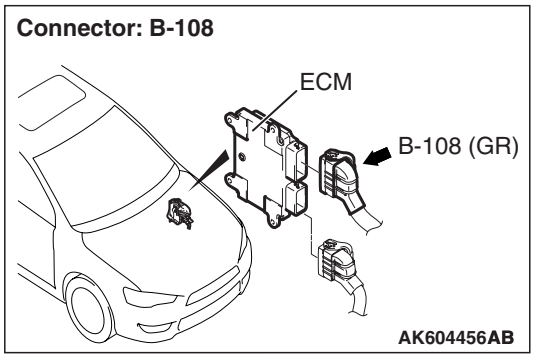
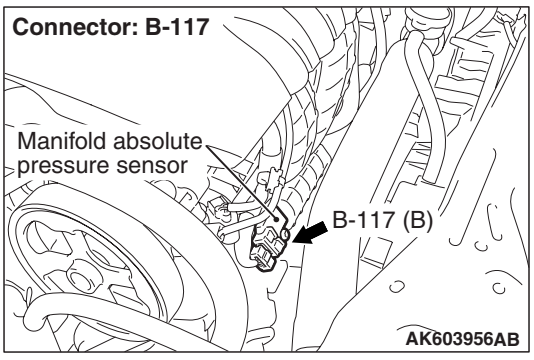




TSB Revision

CIRCUIT OPERATION

- A 5-volt voltage is supplied to the manifold absolute pressure sensor power terminal (terminal No. 3) from ECM (terminal No. 44). The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 46).
- A voltage that is proportional to the intake manifold pressure is sent to the ECM (terminal No. 45) from the manifold absolute pressure sensor output terminal (terminal No. 1).

TECHNICAL DESCRIPTION

- The manifold absolute pressure sensor outputs a voltage which corresponds to the intake manifold pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Manifold absolute pressure sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

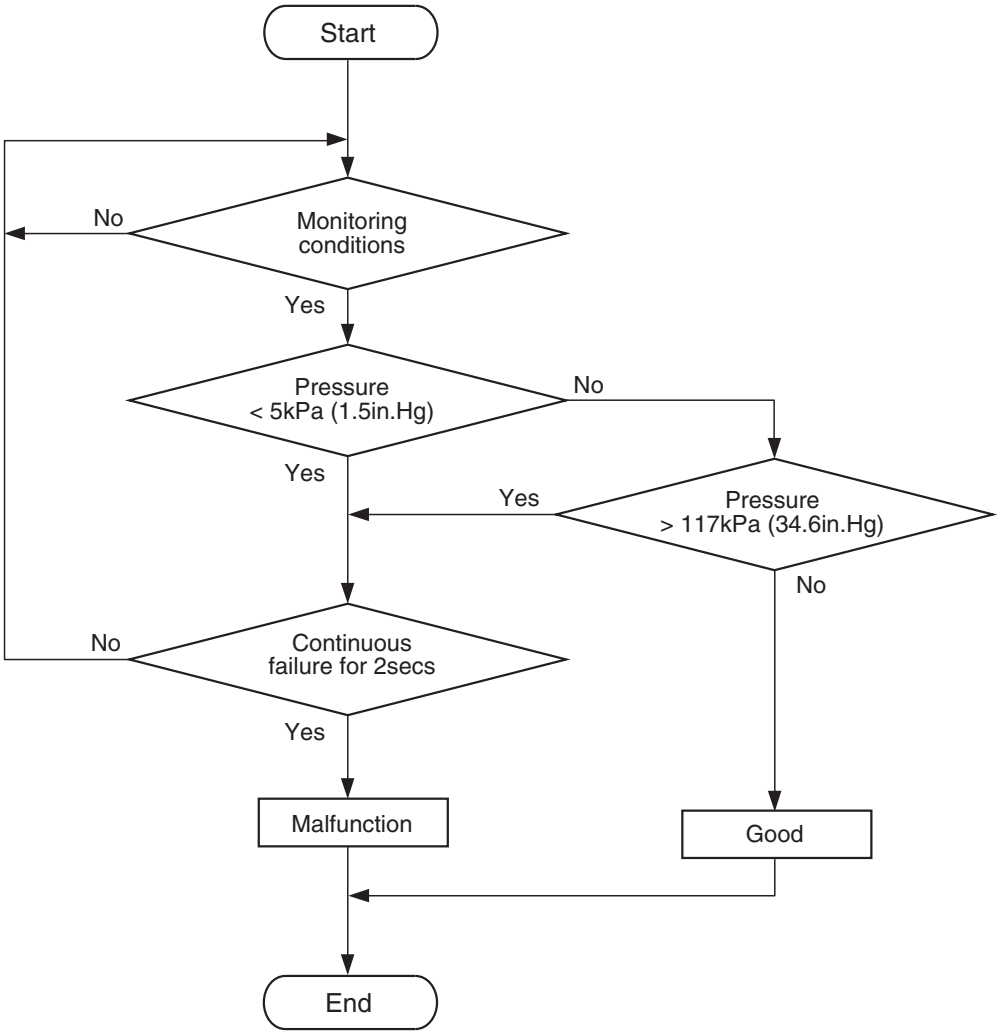
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Throttle position sensor
- Mass airflow sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 8 minutes or more have passed since the engine starting sequence was completed, when the engine coolant temperature at engine start is 0° C (32° F) or lower.

Judgement Criterion

- Manifold absolute pressure sensor output voltage has continued to be 4.6 volts [corresponding to a manifold absolute pressure of 117 kPa (34.6 in.Hg)] or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Manifold absolute pressure sensor failed.
- Open manifold absolute pressure sensor circuit, or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

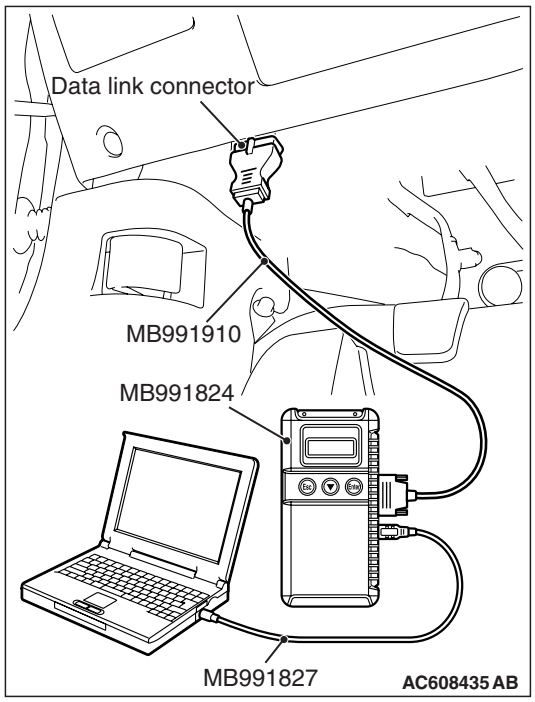
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

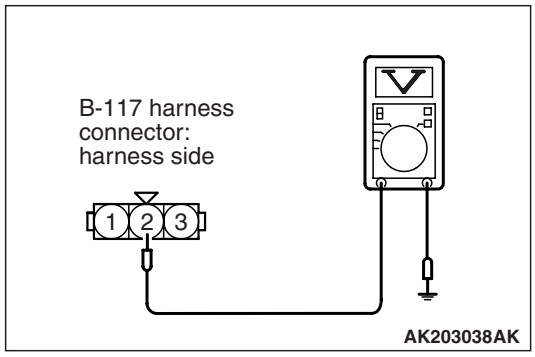


(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
  - When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
  - When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
  - When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
  - When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).
(4) Start the engine.
  - When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
  - When the engine is suddenly revved, manifold absolute pressure varies.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the ground voltage at manifold absolute pressure sensor connector B-117 by backprobing.



(1) Do not disconnect the connector B-117.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground by backprobing.
  - Voltage should be 0.5 volt or less.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage 0.5 volt or less?

YES : Go to Step 6.
NO : Go to Step 3.

TSB Revision

STEP 3. Check harness connector B-117 at the manifold absolute pressure sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

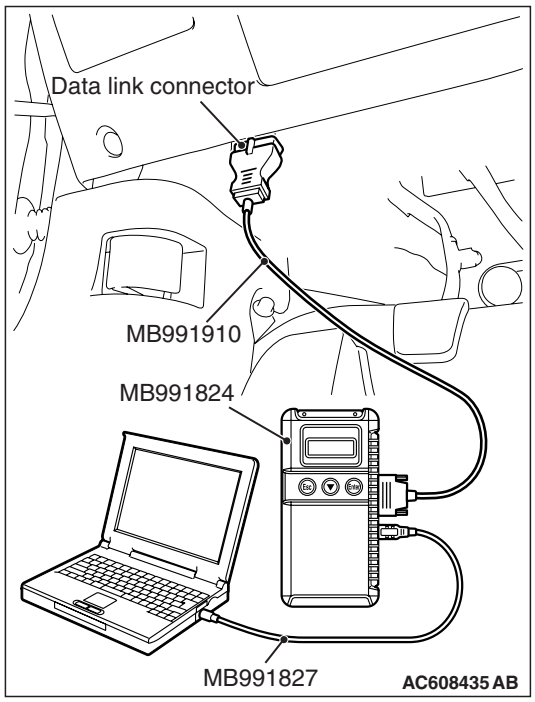
STEP 4. Check for open circuit between manifold absolute pressure sensor connector B-117 (terminal No. 2) and ECM connector B-108 (terminal No. 46).

Q: Is the harness wire in good condition?

YES : Go to Step 5.

NO : Repair it. Then go to Step 7.

STEP 5. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.



(1) Turn the ignition switch to the "ON" position.

(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.

STEP 6. Check harness connector B-117 at the manifold absolute pressure sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the manifold absolute pressure sensor. Then go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

TSB Revision

STEP 7. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

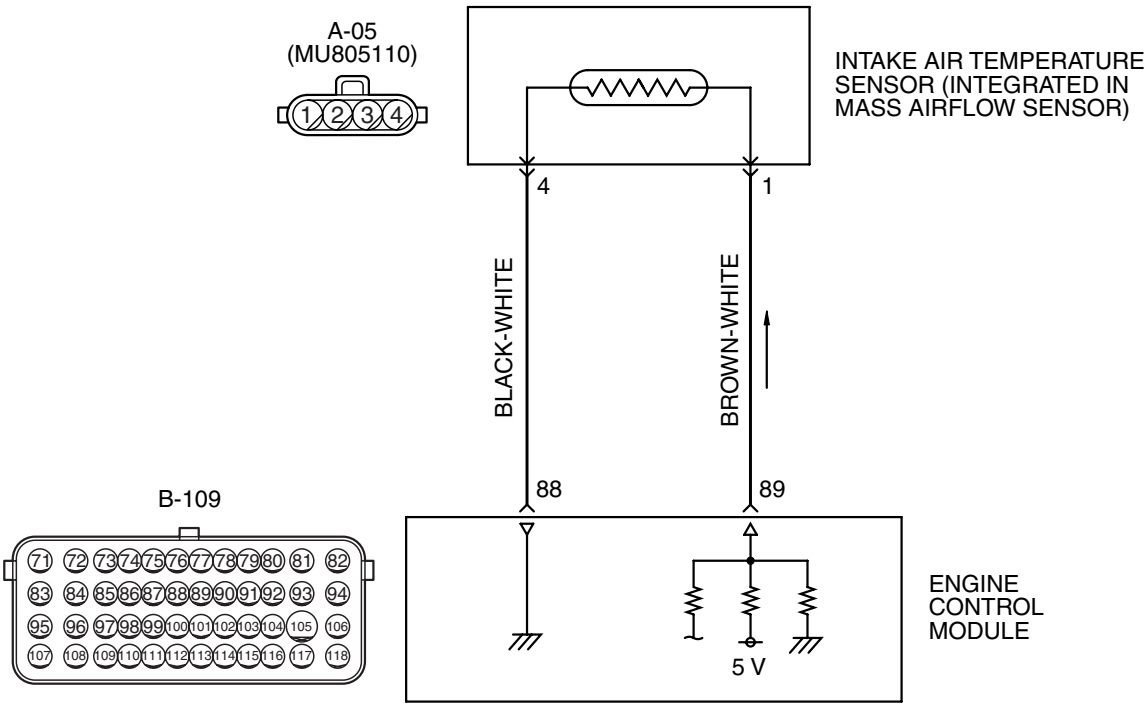
Q: Is DTC P0108 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0111: Intake Air Temperature Circuit Range/Performance Problem

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



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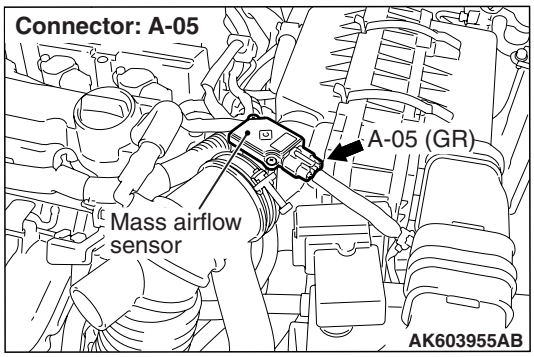
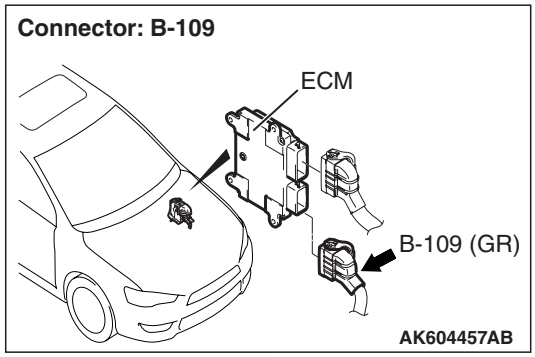




TSB Revision

CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage does not change when specified go/stop operations are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

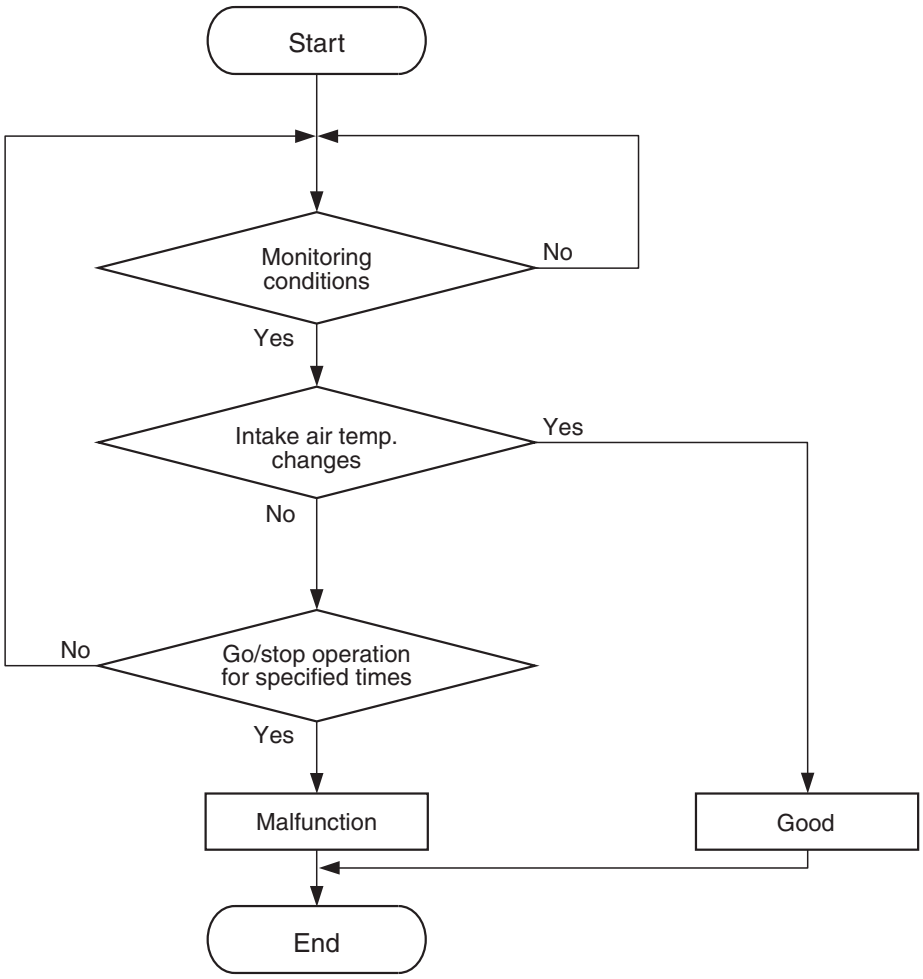
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604314

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Repeat 2 or more times: drive[*1], stop[*2].
  Drive[*1]: vehicle speed higher than 50 km/h (31 mph) lasting a total of more than 60 seconds.
  Stop[*2]: vehicle speed lower than 1.5 km/h (1.0 mph) lasting more than 30 seconds.

Judgement Criterion

- Changes in the intake air temperature is lower than 1° C (1.8° F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 8 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Harness damage or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

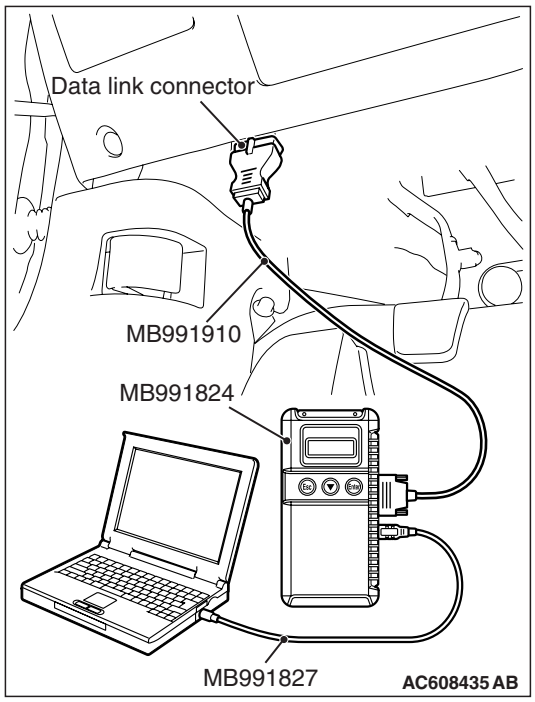
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

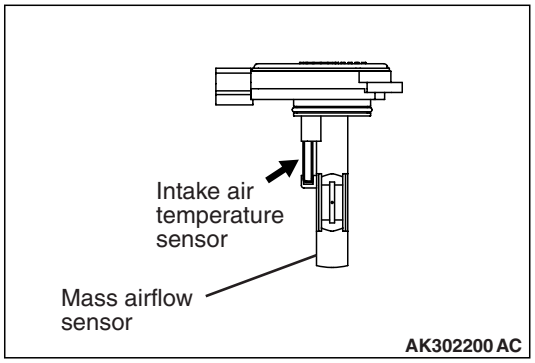
STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Remove the mass airflow sensor from the air intake hose.
(3) Turn the ignition switch to the "ON" position.
(4) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.





(5) Heating the sensor using a hair drier.
  - The indicated temperature increases.

  NOTE: Do not allow it to increase over 80°C (176°F).
(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Attach the mass airflow sensor.

Q: Is the sensor operating properly?

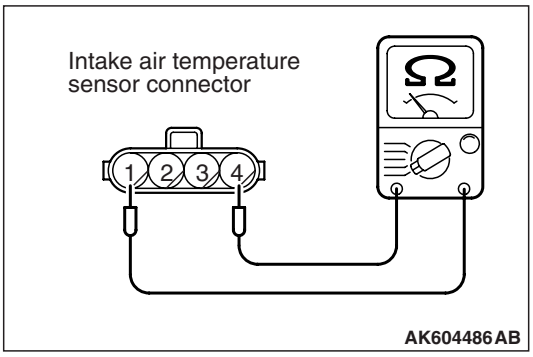
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

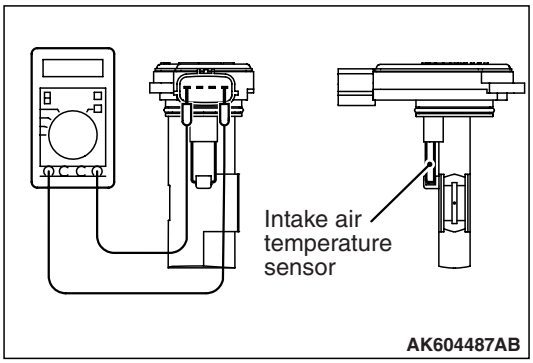
NO : Go to Step 2.

STEP 2. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-05.

(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.





(3) Measure resistance while heating the sensor using a hair drier.

Standard value:
13 – 17 kΩ [at –20° C (–4° F)]
5.4 – 6.6 kΩ [at 0° C (32° F)]
2.3 – 3.0 kΩ [at 20° C (68° F)]
1.0 – 1.65 kΩ [at 40° C (104° F)]
0.56 – 0.76 kΩ [at 60° C (140° F)]
0.31 – 0.43 kΩ [at 80° C (176° F)]

Q: Is the measured resistance at the standard value?

YES : Go to Step 3.
NO : Replace the mass airflow sensor. Then go to Step 9.

STEP 3. Check harness connector A-05 at the intake air temperature sensor for damage.

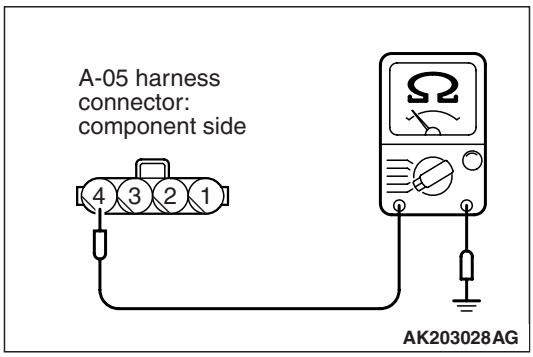
Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 4. Check the continuity at intake air temperature sensor harness side connector A-05.

(1) Disconnect the connector A-05 and measure at the harness side.

(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 6. Check for harness damage between intake air temperature sensor connector A-05 (terminal No. 4) and ECM connector B-109 (terminal No. 88).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 7. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 8. Check for harness damage between intake air temperature sensor connector A-05 (terminal No. 1) and ECM connector B-109 (terminal No. 89).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

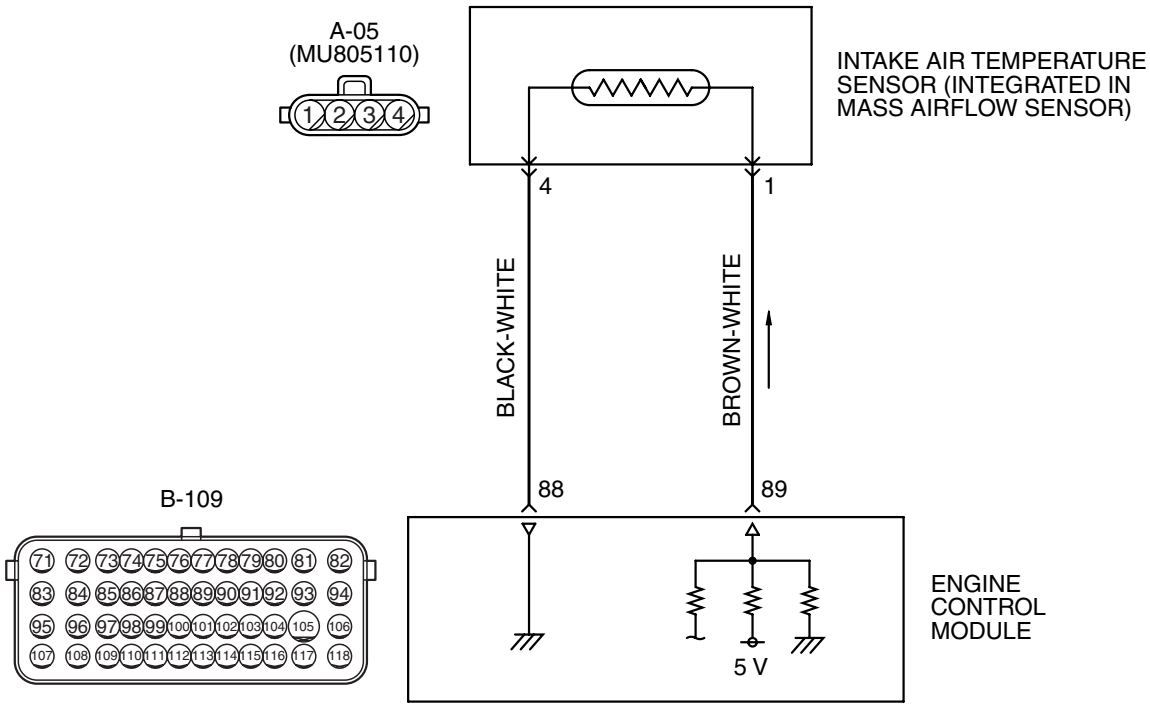
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 8 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0111 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0112: Intake Air Temperature Circuit Low Input

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



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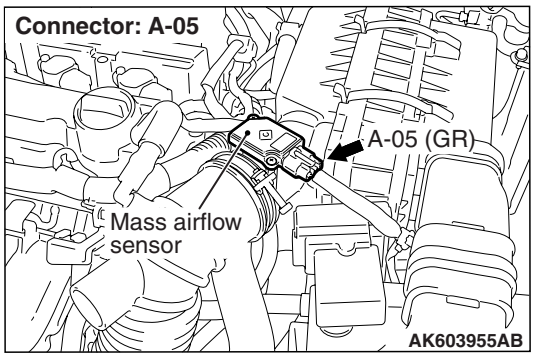
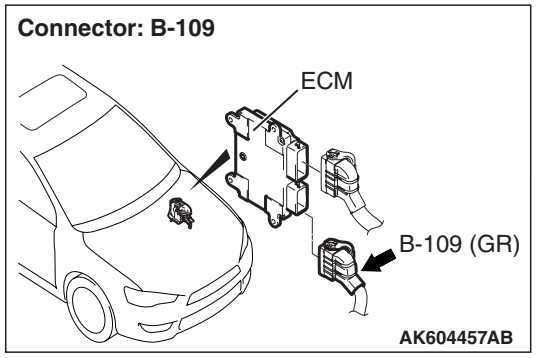




CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of

- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM checks whether this voltage is within a specified range.

specified range.

TSB Revision

MONITOR EXECUTION
Continuous

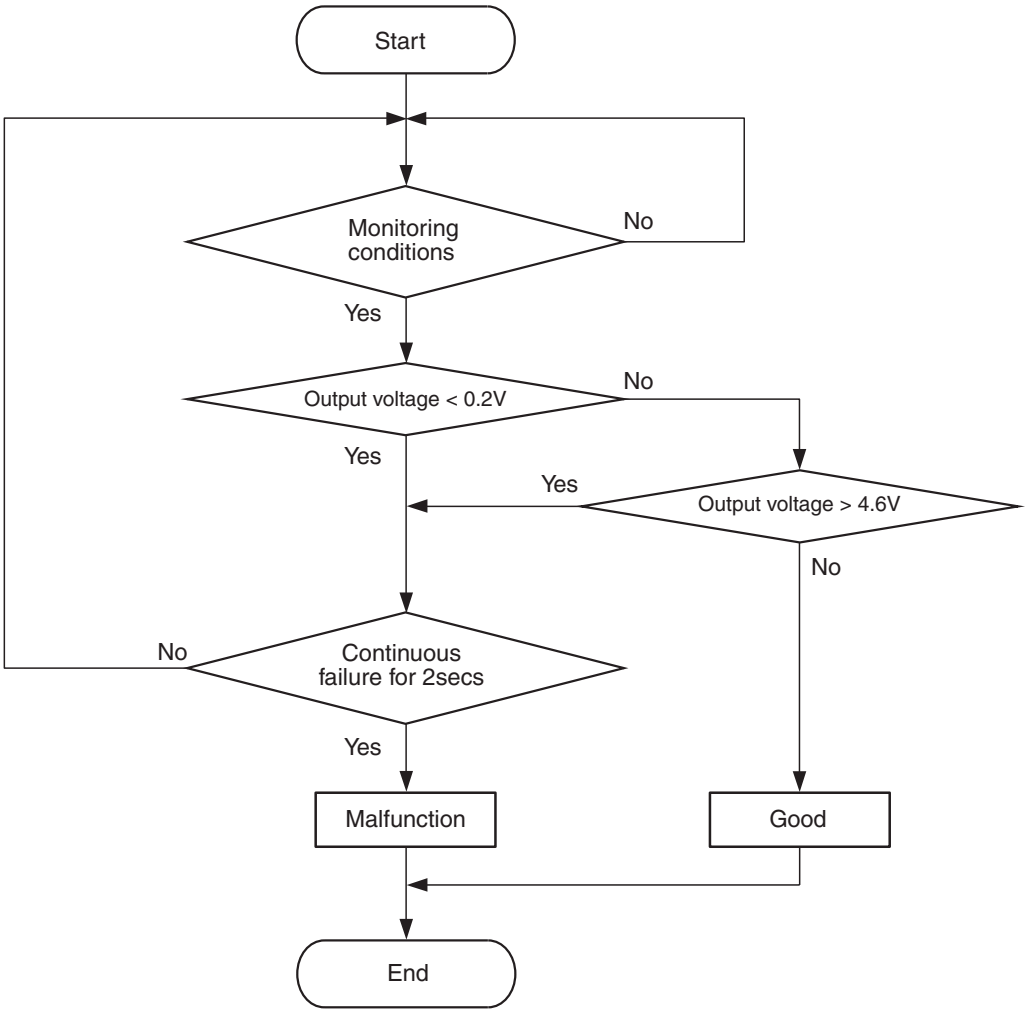
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604315

Check Condition
- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion
- Intake air temperature sensor output voltage has continued to be 0.2 volt or lower [corresponding to an intake air temperature of 115° C (239° F) or higher] for 2 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

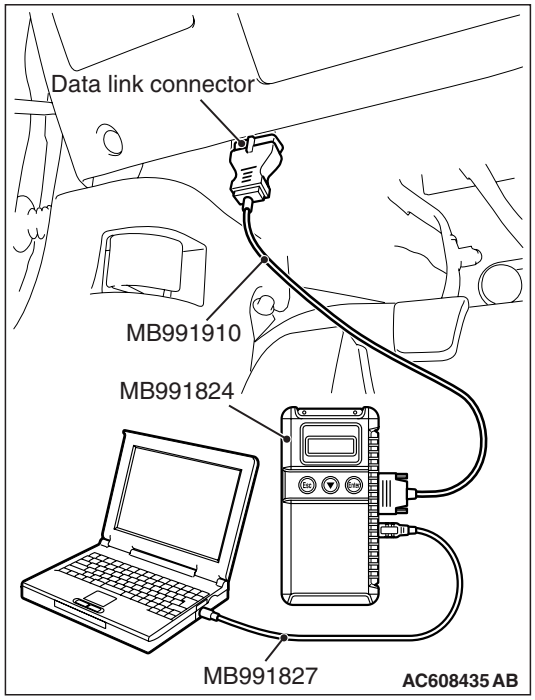
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Shorted intake air temperature sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

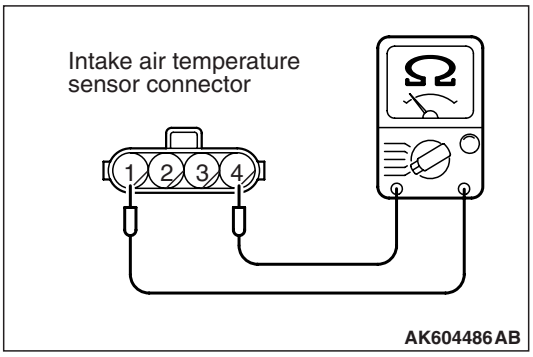
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector A-05 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.



STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-05.
(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.31 –17 kΩ)

Q: Is the measured resistance between 0.31 and 17 kΩ?

YES : Go to Step 4.
NO : Replace the mass airflow sensor. Then go to Step 6.

STEP 4. Check for short circuit to ground between intake air temperature sensor connector A-05 (terminal No. 1) and ECM connector B-109 (terminal No. 89).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 6.

STEP 5. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

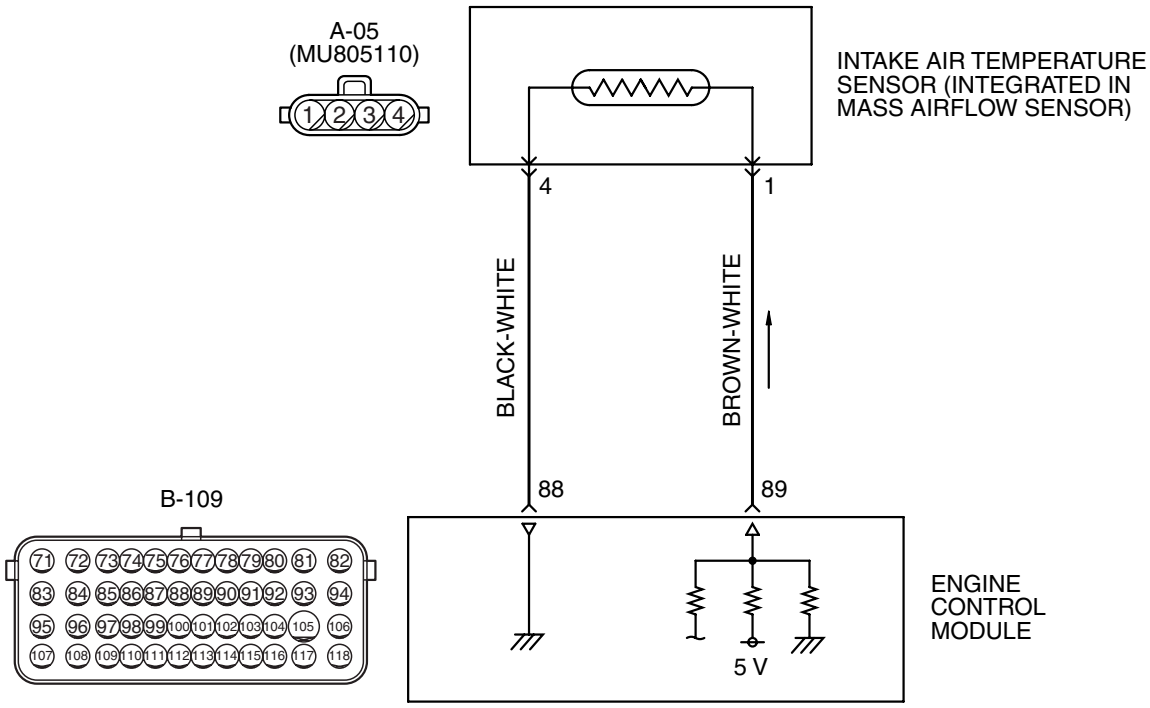
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0112 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0113: Intake Air Temperature Circuit High Input

INTAKE AIR TEMPERATURE SENSOR CIRCUIT



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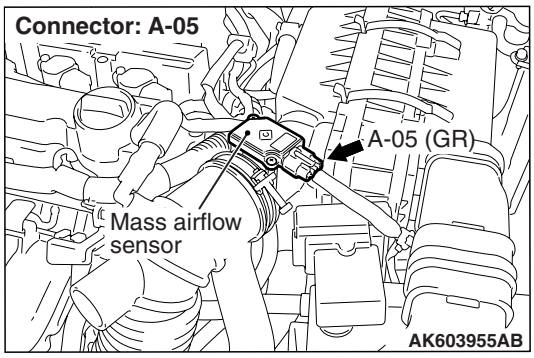
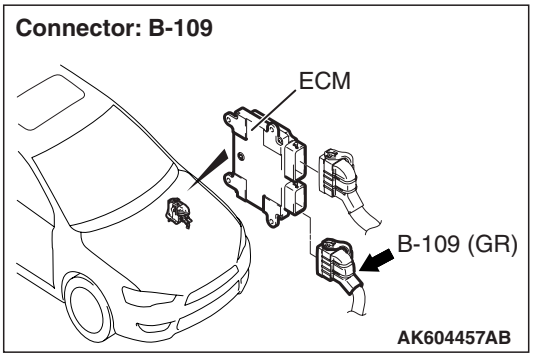




CIRCUIT OPERATION

- Approximately 5 volts are applied to the intake air temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 89) via the resistor in the ECM. The ground terminal (terminal No. 4) is grounded with ECM (terminal No. 88).
- The intake air temperature sensor is a negative temperature coefficient type of resistor. When the intake air temperature rises, the resistance decreases.
- The intake air temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The intake air temperature sensor converts the intake air temperature to a voltage.
- The ECM checks whether this voltage is within a specified range.

TSB Revision

DESCRIPTIONS OF MONITOR METHODS

Intake air temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

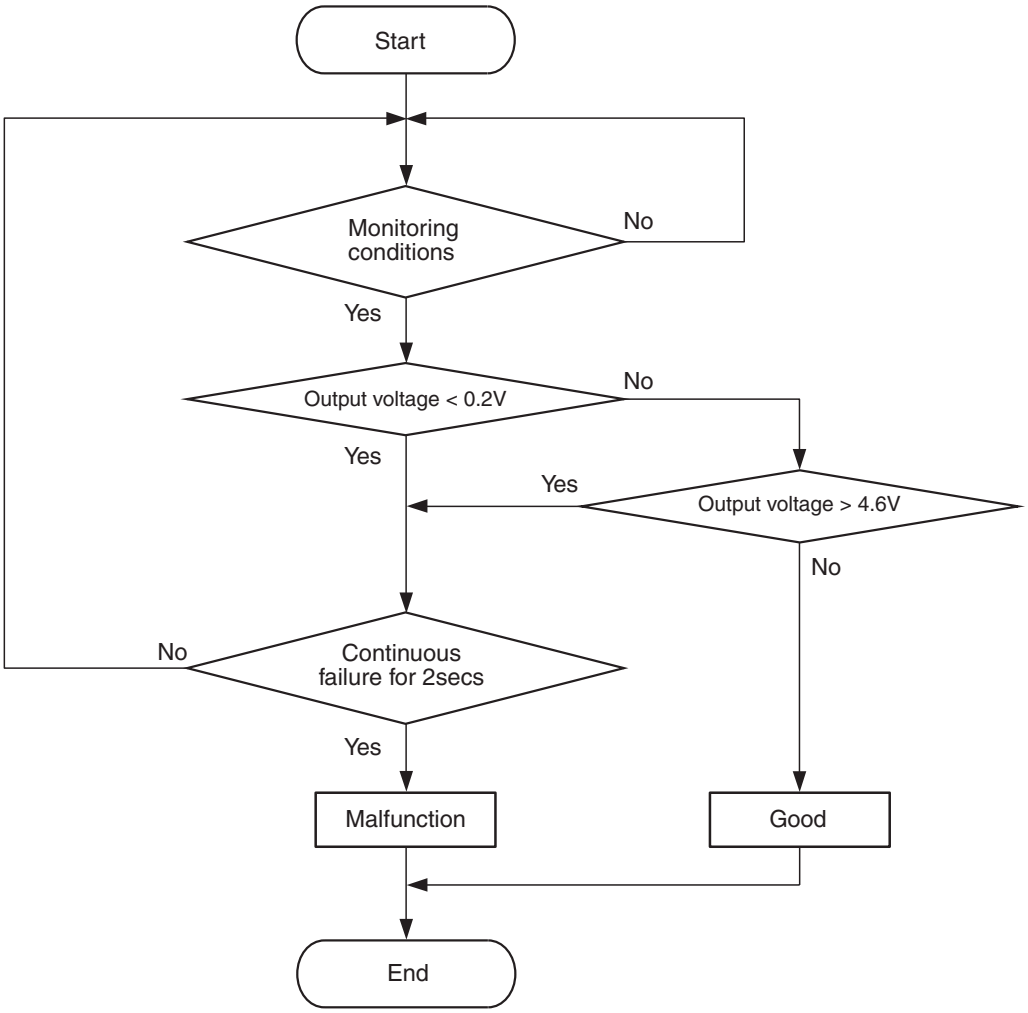
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604315

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Intake air temperature sensor output voltage has continued to be 4.6 volts or higher [corresponding to an intake air temperature of -40° C (-40° F) or lower] for 2 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

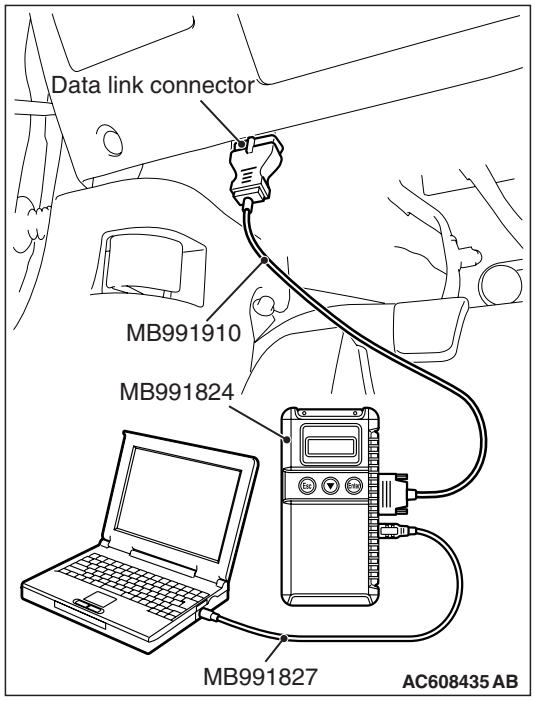
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake air temperature sensor failed.
- Open intake air temperature sensor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
  - The intake air temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

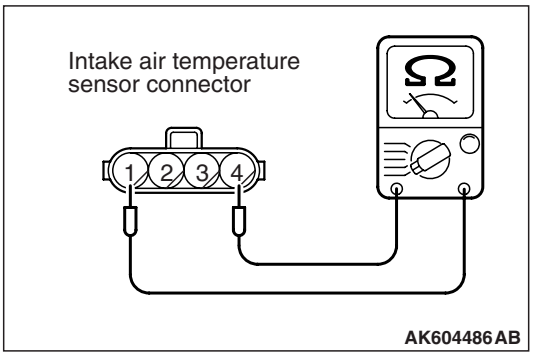
NO : Go to Step 2.

STEP 2. Check harness connector A-05 at the intake air temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

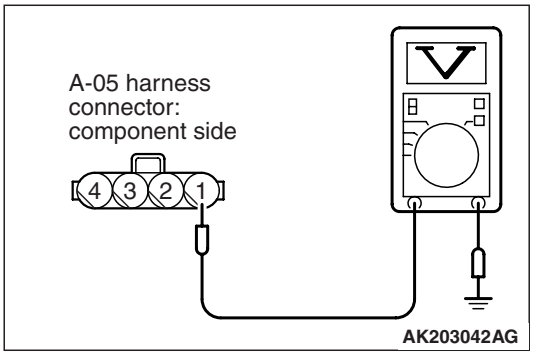


STEP 3. Check the intake air temperature sensor.

(1) Disconnect the intake air temperature sensor connector A-05.
(2) Measure the resistance between intake air temperature sensor side connector terminal No. 1 and No. 4.
- There should be continuity. (0.31 –17 kΩ)

Q: Is the measured resistance between 0.31 and 17 kΩ?

YES : Go to Step 4.
NO : Replace the mass airflow sensor. Then go to Step 10.



STEP 4. Measure the sensor supply voltage at intake air temperature sensor harness side connector A-05.

(1) Disconnect the connector A-05 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

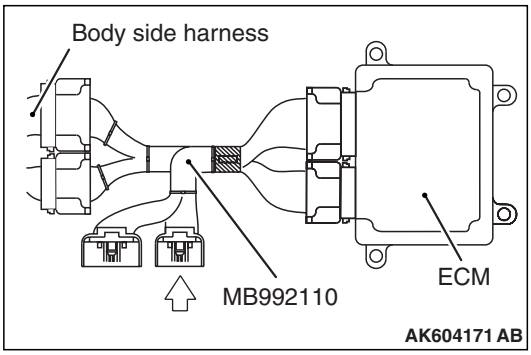
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Check harness connector B-109 at ECM for damage.

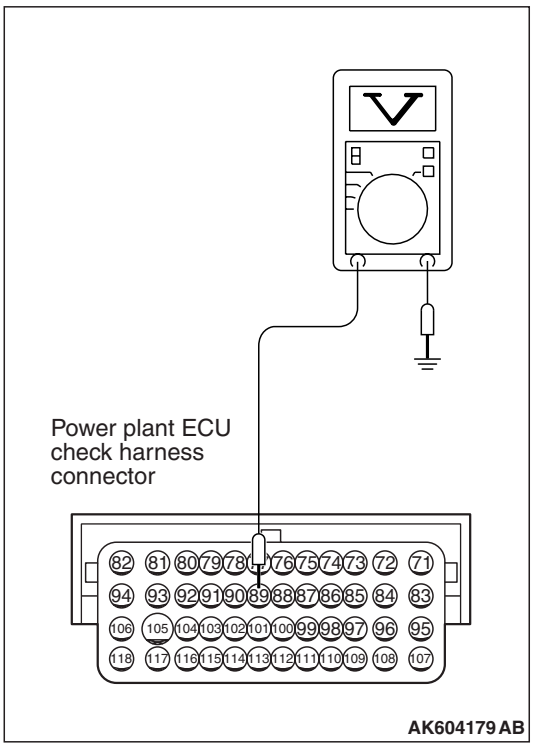
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Measure the sensor supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the intake air temperature sensor connector A-05.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 89 and ground.
- Voltage should be between 4.5 and 4.9 volts.

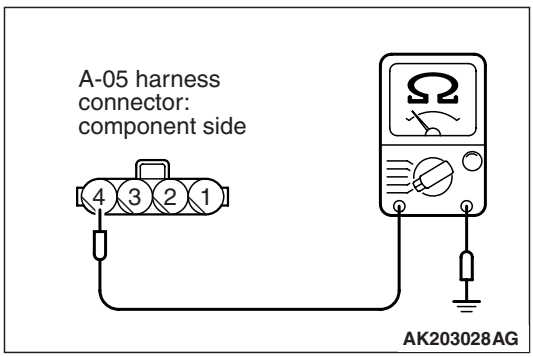
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Repair harness wire between intake air temperature sensor connector A-05 (terminal No. 1) and ECM connector B-109 (terminal No. 89) because of open circuit. Then go to Step 10.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

STEP 7. Check the continuity at intake air temperature sensor harness side connector A-05.



(1) Disconnect the connector A-05 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

NO : Go to Step 8.

TSB Revision

STEP 8. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 9. Check for open circuit between intake air temperature sensor connector A-05 (terminal No. 4) and ECM connector B-109 (terminal No. 88).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.
NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

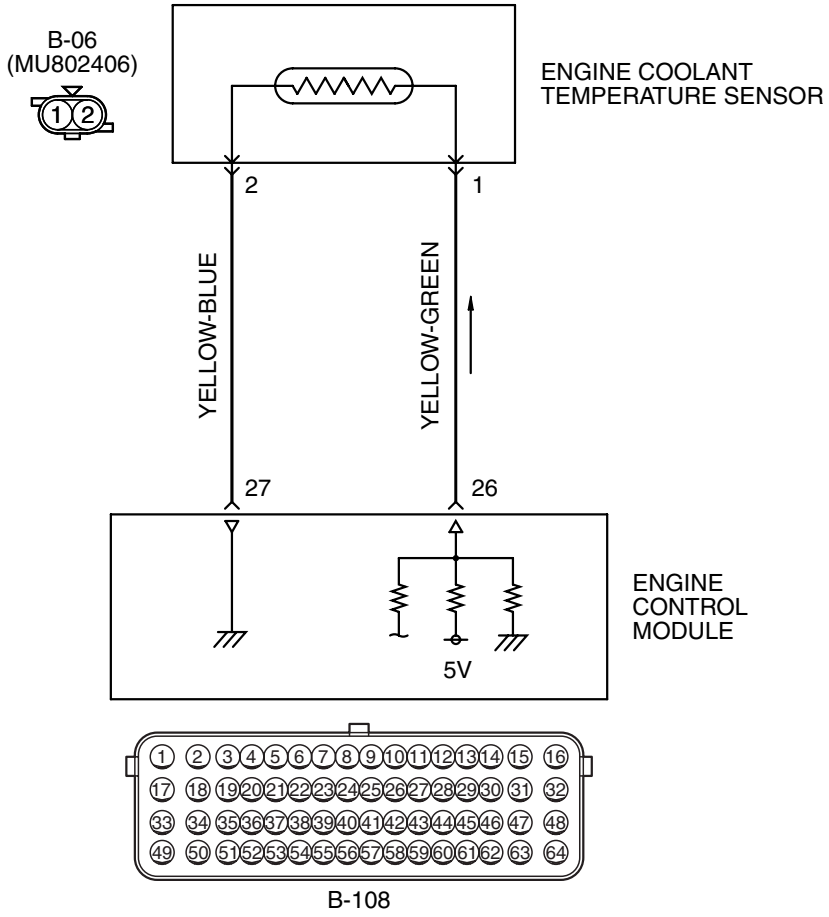
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0113 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0116: Engine Coolant Temperature Circuit Range/Performance Problem

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



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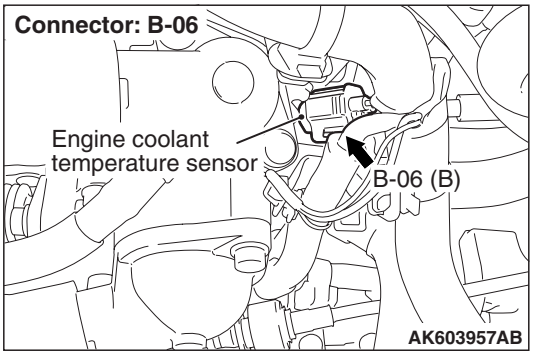
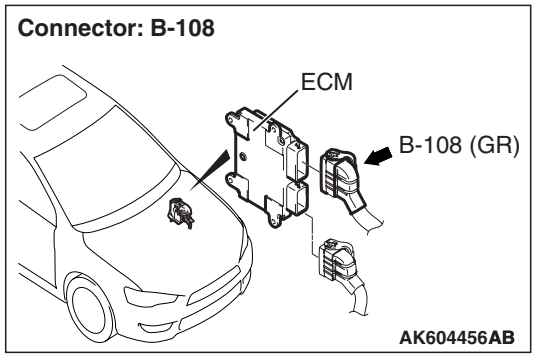




TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage does not change for specified period when engine coolant temperature sensor output voltage at engine start is over 7° C (45° F).

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

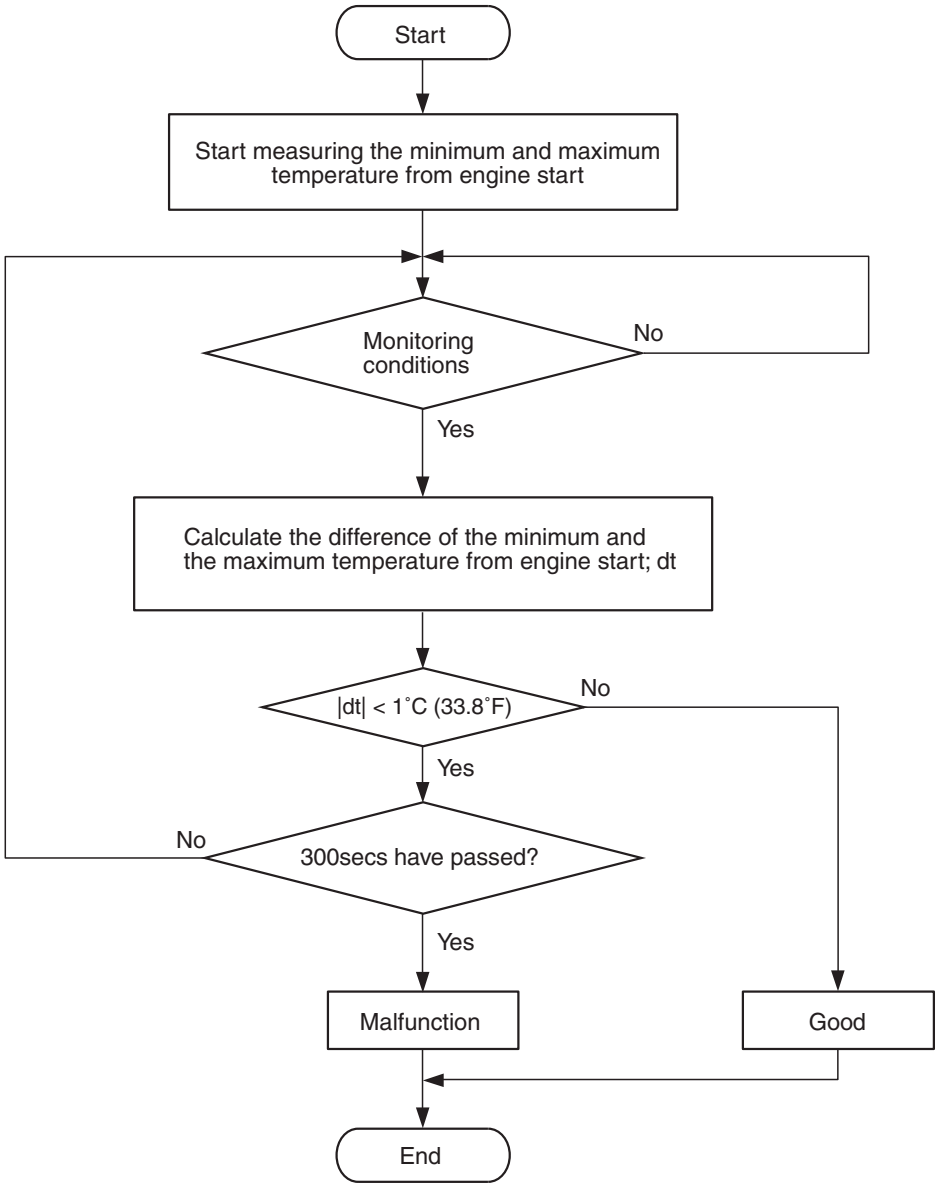
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604316

Check Condition

- Engine coolant temperature was 7° C (45° F) or more when the engine started.

Judgement Criteria

- Engine coolant temperature fluctuates within 1° C (33.8° F) after 5 minutes have passed since the engine was started.
- However, time is not counted if any of the following conditions are met.
  1. Intake air temperature is 60° C (140° F) or more.
  2. Mass airflow sensor outputs is 10 g/sec or less.
  3. During fuel shut-off operation.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 9 P.13A-10.

TSB Revision

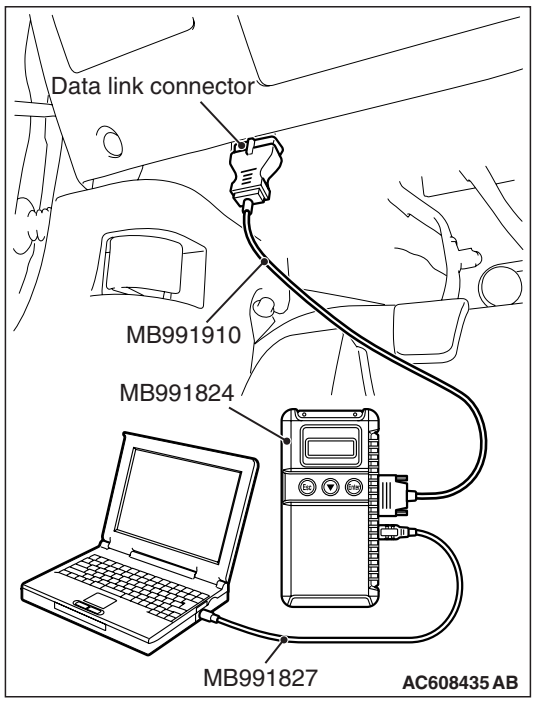
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

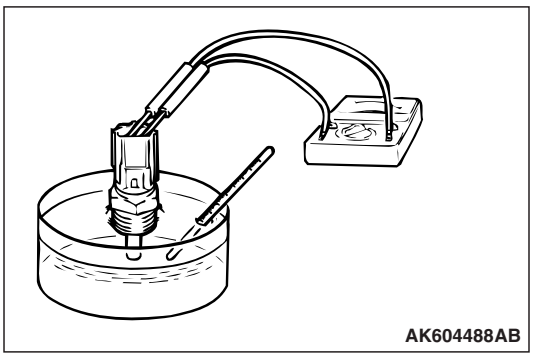
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.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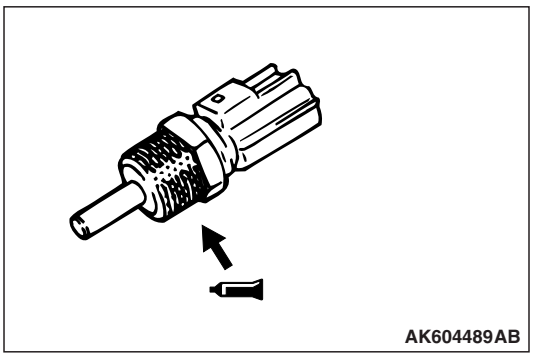

AK604489AB

STEP 2. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-06.
(2) Remove the engine coolant temperature sensor.
(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, measure resistance.

Standard value:
14 – 17 kΩ [at –20° C (–4° F)]
5.1 – 6.5 kΩ [at 0° C (32° F)]
2.1 – 2.7 kΩ [at 20° C (68° F)]
0.9 – 1.3 kΩ [at 40° C (104° F)]
0.48 – 0.68 kΩ [at 60° C (140° F)]
0.26 – 0.36 kΩ [at 80° C (176° F)]

(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ±9 N· m (22 ±6 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Go to Step 3.
NO : Replace the engine coolant temperature sensor. Then go to Step 9.

STEP 3. Check harness connector B-06 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

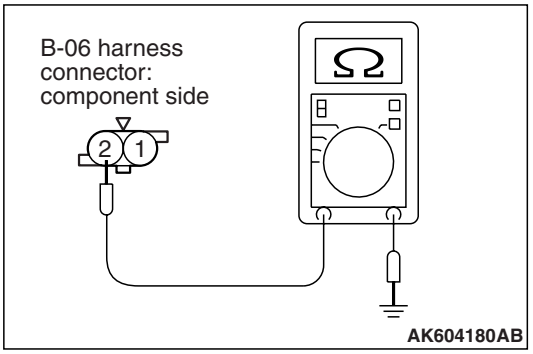
YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 4. Check the continuity at engine coolant temperature sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 5.



AK604180AB

STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 6. Check for harness damage between engine coolant temperature sensor connector B-06 (terminal No. 2) and ECM connector B-108 (terminal No. 27).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 7. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 8. Check for harness damage between engine coolant temperature sensor connector B-06 (terminal No. 1) and ECM connector B-108 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : Repair it. Then go to Step 9.

STEP 9. Test the OBD-II drive cycle.

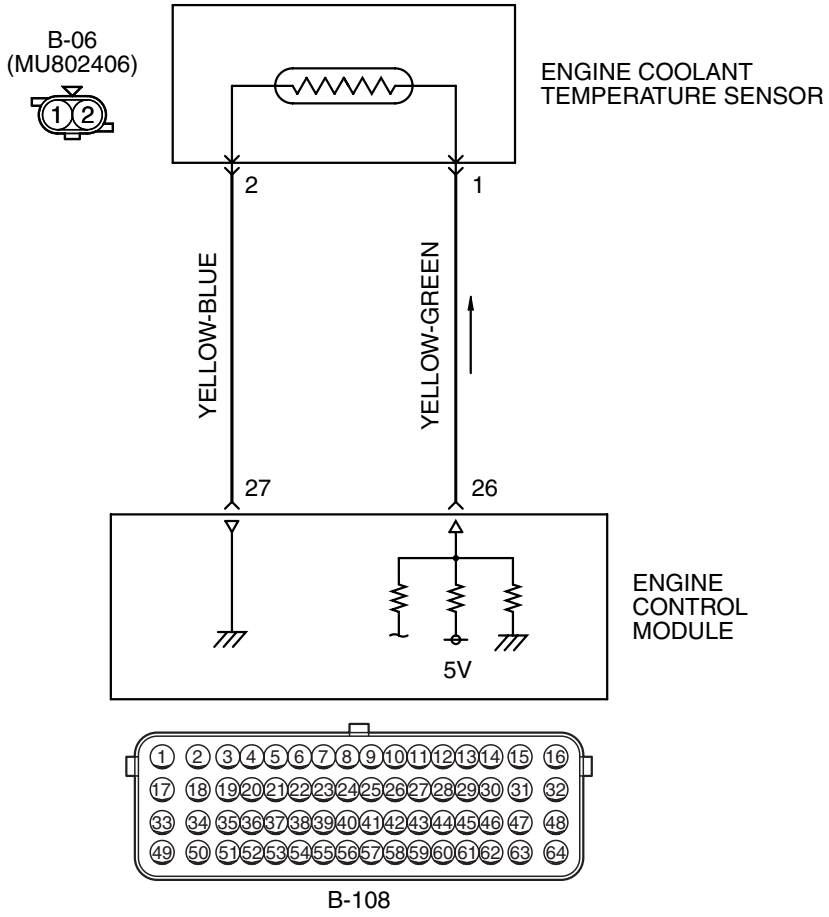
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 9 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0116 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0117: Engine Coolant Temperature Circuit Low Input

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



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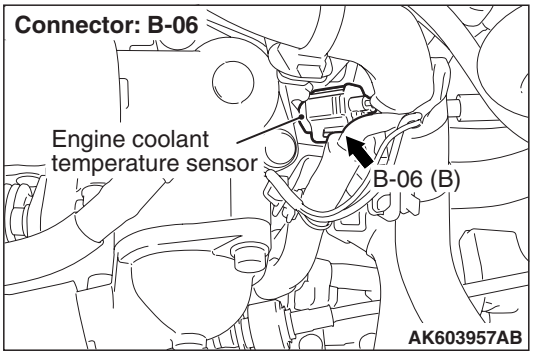
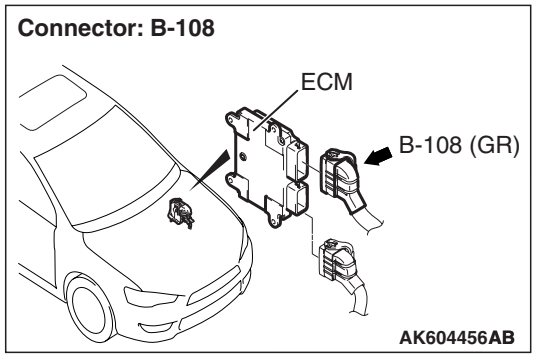




TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

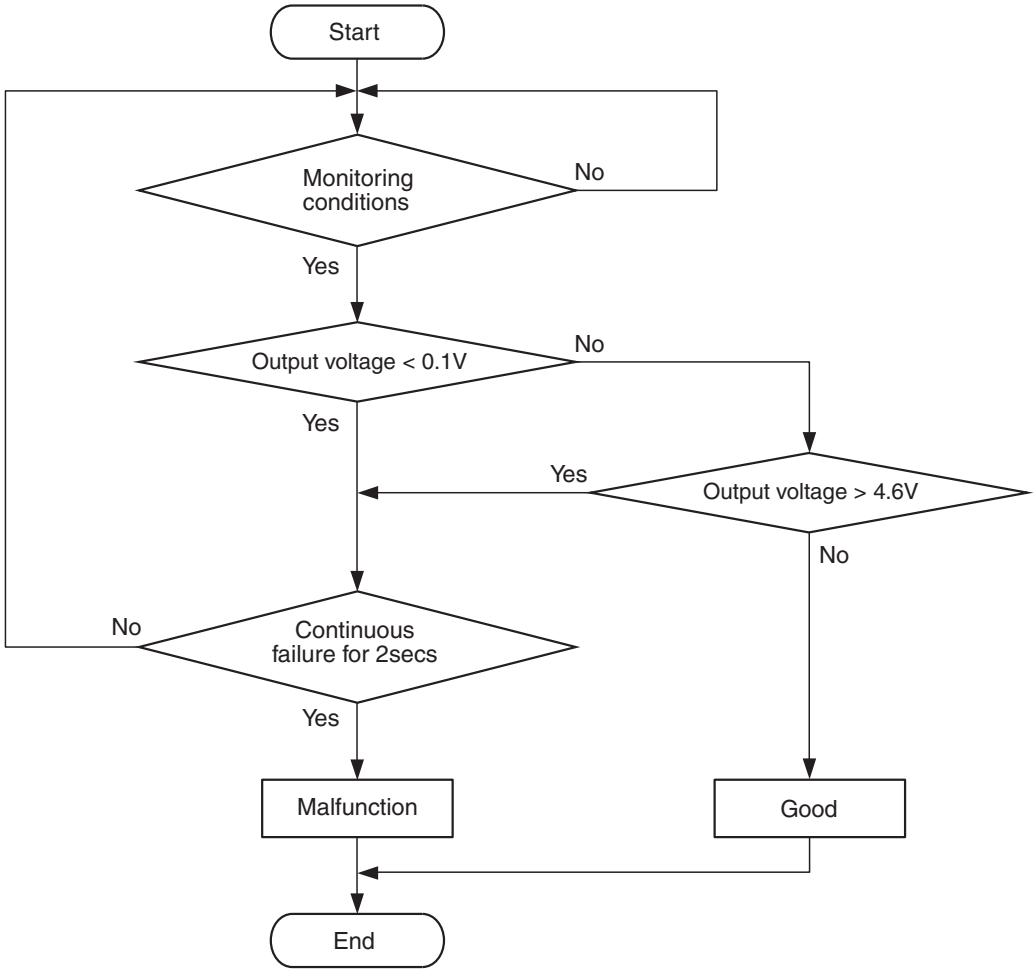
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604317

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Engine coolant temperature sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Shorted engine coolant temperature sensor circuit, or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

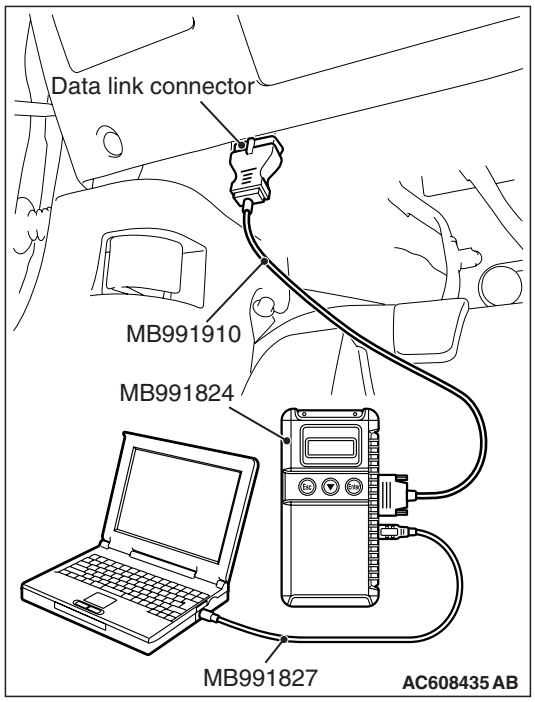
STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-06 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 3. Check for short circuit to ground between engine coolant temperature sensor connector B-06 (terminal No. 1) and ECM connector B-108 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Go to Step 4.
NO : Repair it. Then go to Step 6.

STEP 4. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

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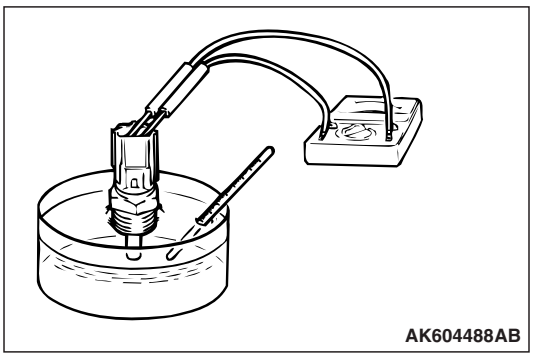
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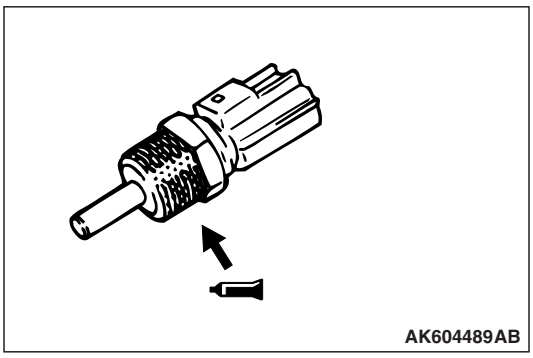
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STEP 5. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-06.
(2) Remove the engine coolant temperature sensor.
(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Standard value:
14 – 17 kΩ [at –20° C (–4° F)]
5.1 – 6.5 kΩ [at 0° C (32° F)]
2.1 – 2.7 kΩ [at 20° C (68° F)]
0.9 – 1.3 kΩ [at 40° C (104° F)]
0.48 – 0.68 kΩ [at 60° C (140° F)]
0.26 – 0.36 kΩ [at 80° C (176° F)]

(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.
(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ±9 N· m (22 ±6 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : Replace the engine coolant temperature sensor. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

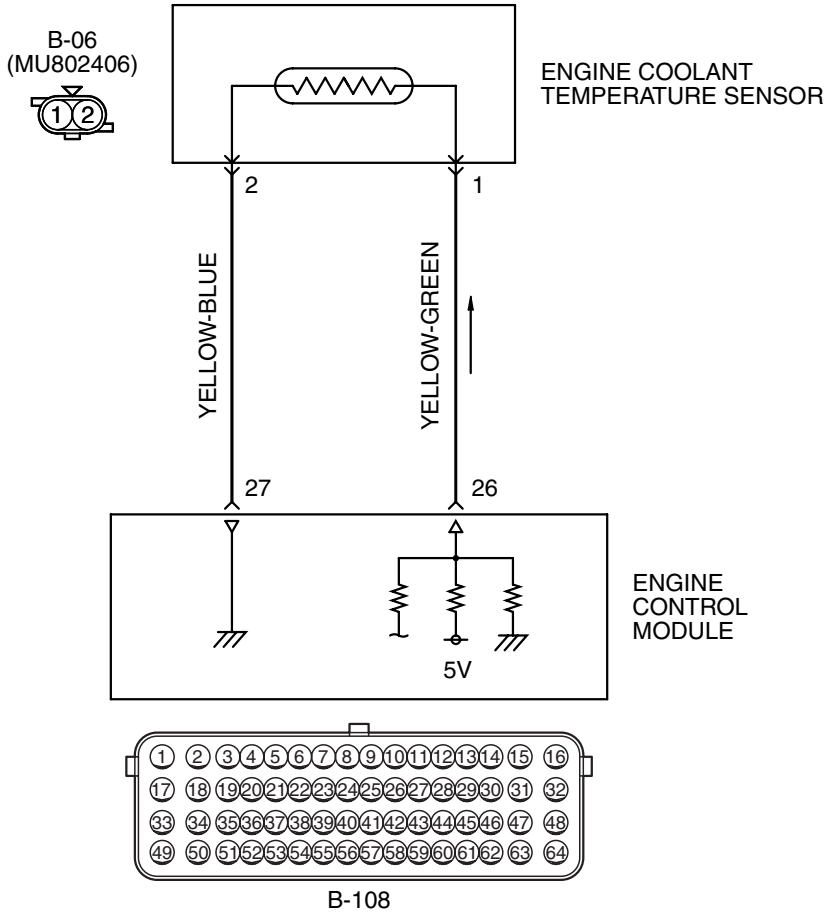
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0117 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0118: Engine Coolant Temperature Circuit High Input

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



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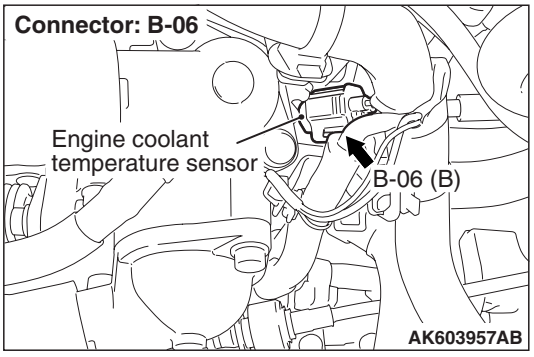
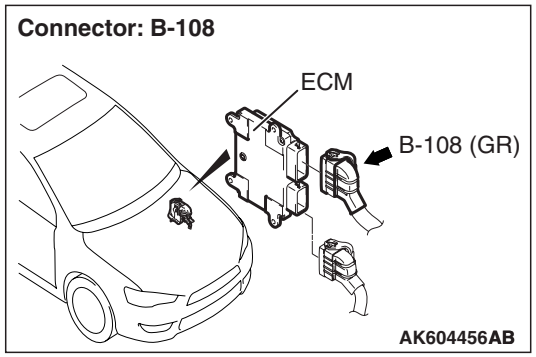




TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

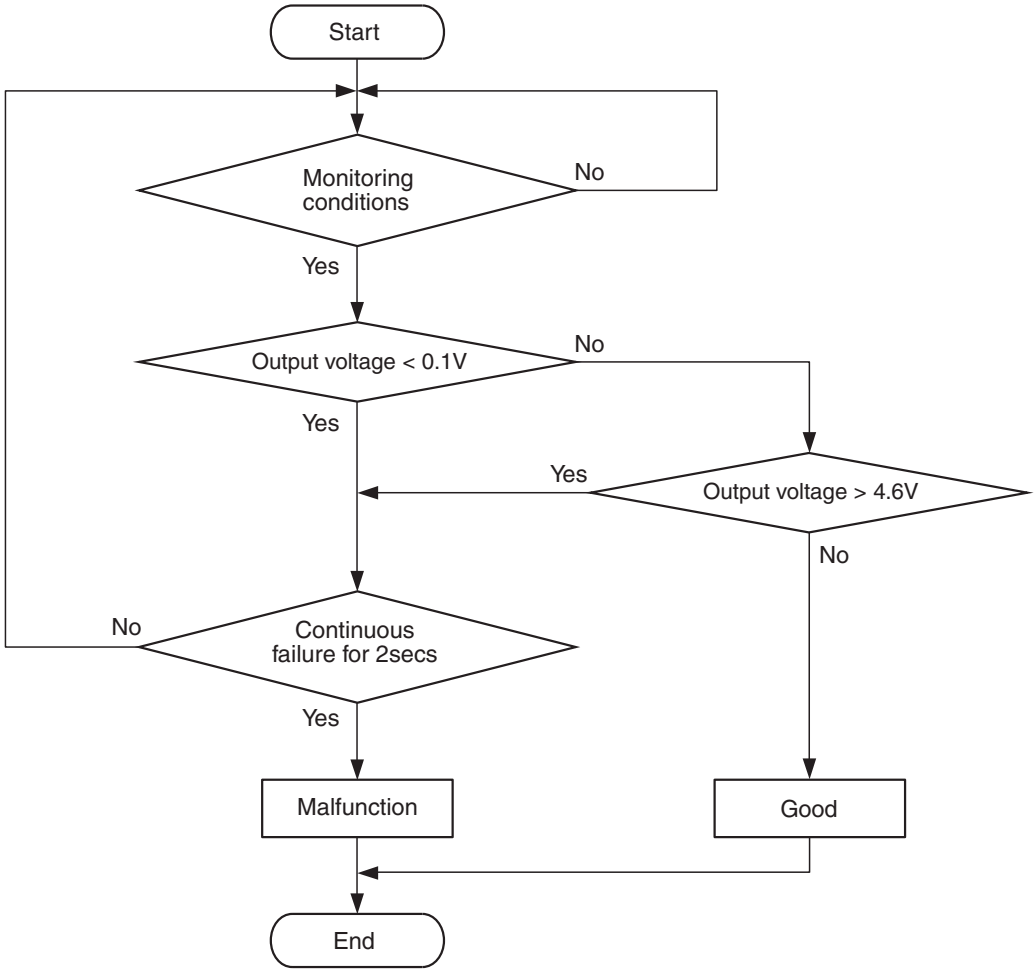
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604317

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Engine coolant temperature sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function-OBD-II Drive Cycle-Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Open engine coolant temperature sensor circuit, or connector damage.
- ECM failed.

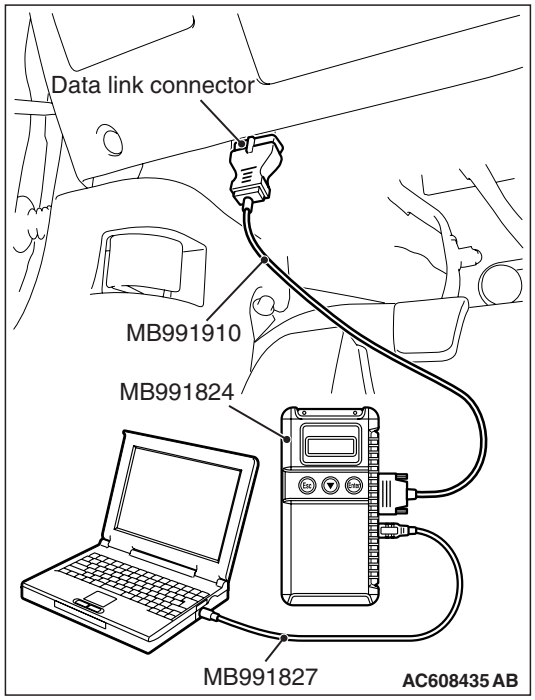
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

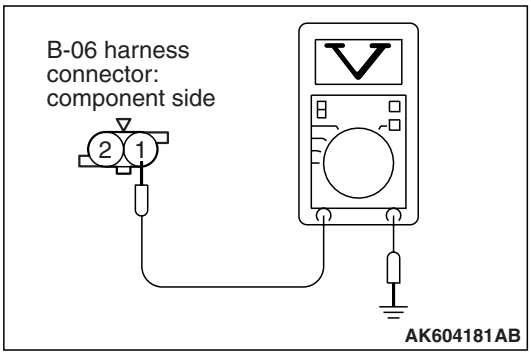
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-06 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



STEP 3. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

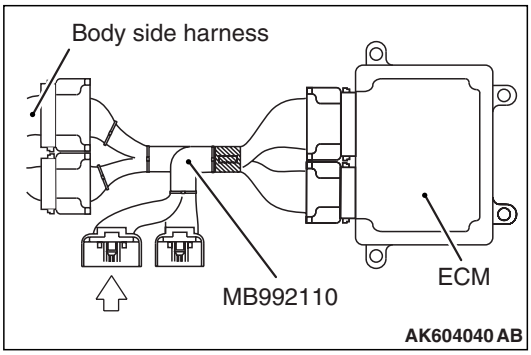
YES : Go to Step 6.
NO : Go to Step 4.

STEP 4. Check harness connector B-108 at ECM for damage.

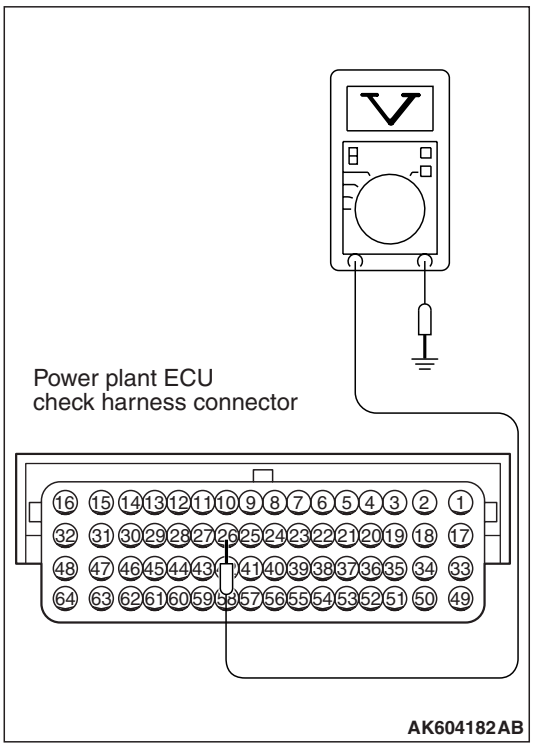
Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 5. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the engine coolant temperature sensor connector B-06.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 26 and ground.
- Voltage should be between 4.5 and 4.9 volts.

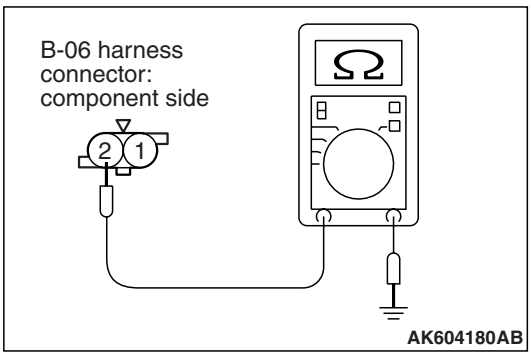
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Repair harness wire between engine coolant temperature sensor connector B-06 (terminal No. 1) and ECM connector B-108 (terminal No. 26) because of open circuit. Then go to Step 10.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

STEP 6. Check the continuity at engine coolant temperature sensor harness side connector B-06.



(1) Disconnect the connector B-06 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 9.
NO : Go to Step 7.

STEP 7. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 8. Check for open circuit between engine coolant sensor connector B-06 (terminal No. 2) and ECM connector B-108 (terminal No. 27).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step10.

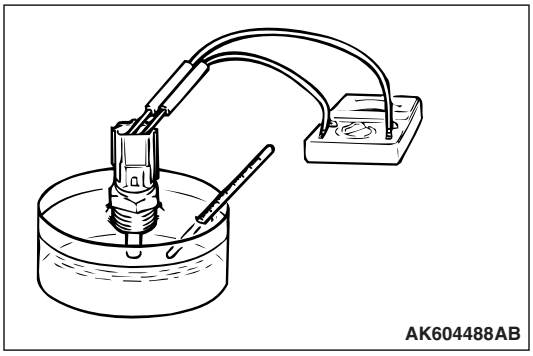
NO : Repair it. Then go to Step 10.

STEP 9. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-06.

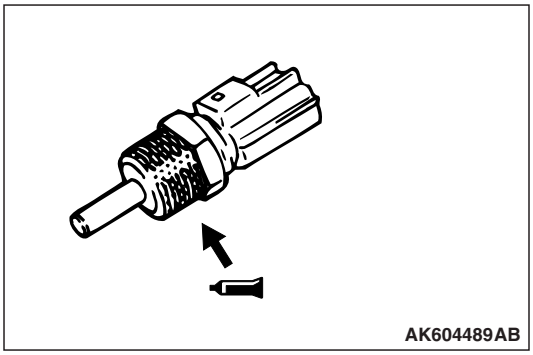
(2) Remove the engine coolant temperature sensor.

(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.


AK604488AB

Standard value:

14 – 17 kΩ [at -20° C (-4° F)]
5.1 – 6.5 kΩ [at 0° C (32° F)]
2.1 – 2.7 kΩ [at 20° C (68° F)]
0.9 – 1.3 kΩ [at 40° C (104° F)]
0.48 – 0.68 kΩ [at 60° C (140° F)]
0.26 – 0.36 kΩ [at 80° C (176° F)]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(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ±9 N· m (22 ±6 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

NO : Replace the engine coolant temperature sensor. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

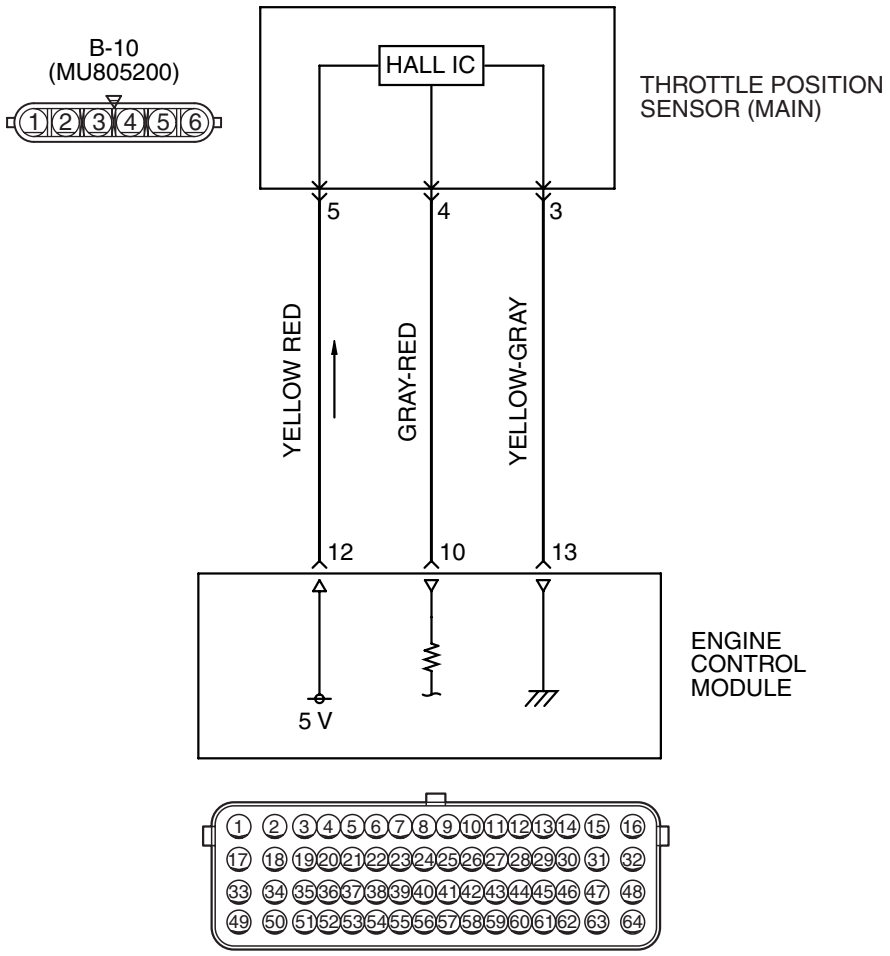
Q: Is DTC P0118 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0122: Throttle Position Sensor (main) Circuit Low Input

THROTTLE POSITION SENSOR (MAIN) CIRCUIT



B-108

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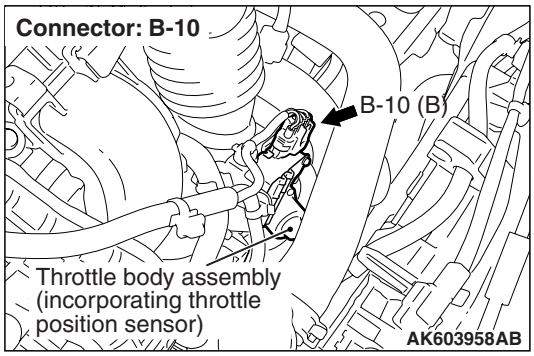
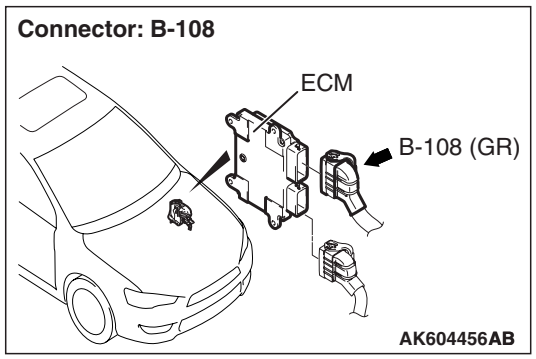




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 10) from the throttle position sensor (main) output terminal (terminal No. 4).
- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

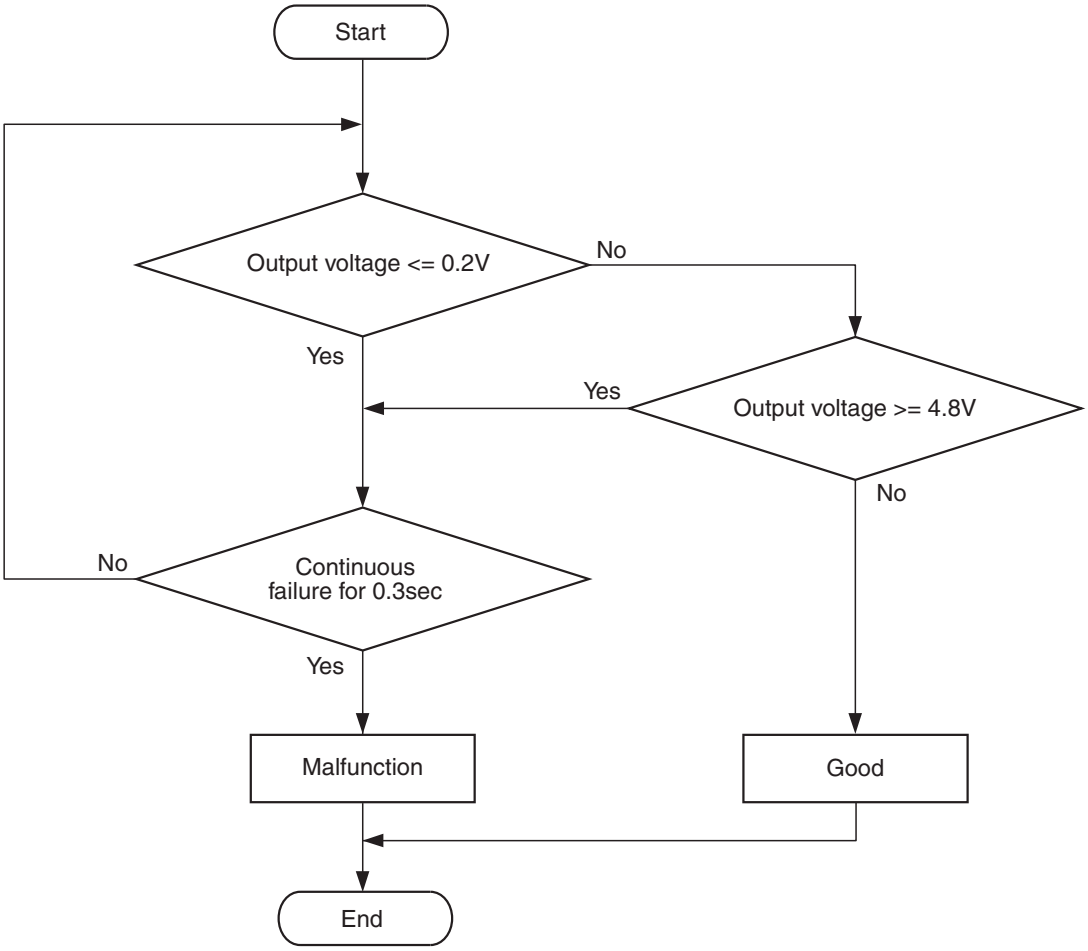
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (main) output voltage should be 0.2 volt or less for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed.
- Open or shorted throttle position sensor (main) circuit, harness damage, or connector damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

None.

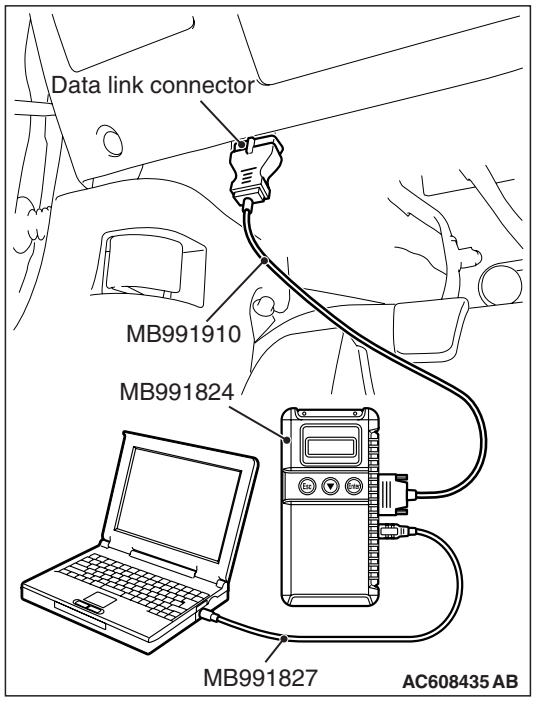
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
  - Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

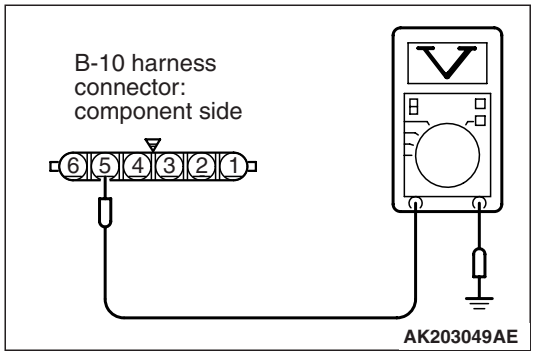
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-10 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 5 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.

STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

STEP 7. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 8. Check for harness damage between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-10 (terminal No. 4) and ECM connector B-108 (terminal No. 10).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP10. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0122 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : The inspection is complete.

STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

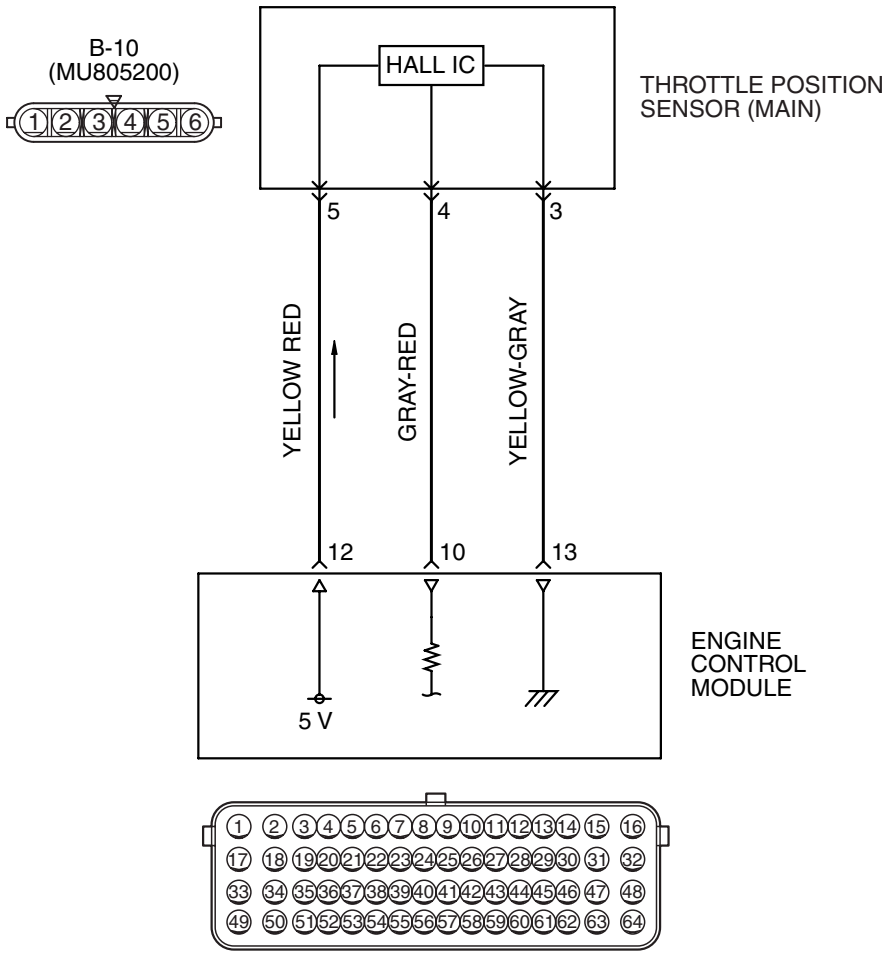
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0122 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0123: Throttle Position Sensor (main) Circuit High Input

THROTTLE POSITION SENSOR (MAIN) CIRCUIT



B-108

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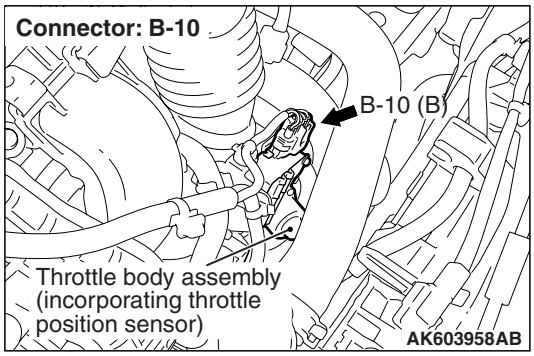
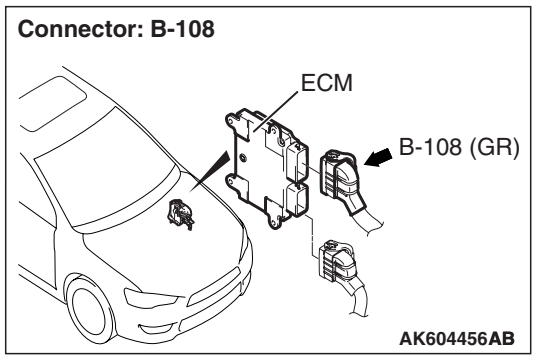




TSB Revision

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (main) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 10) from the throttle position sensor (main) output terminal (terminal No. 4)
- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (main) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

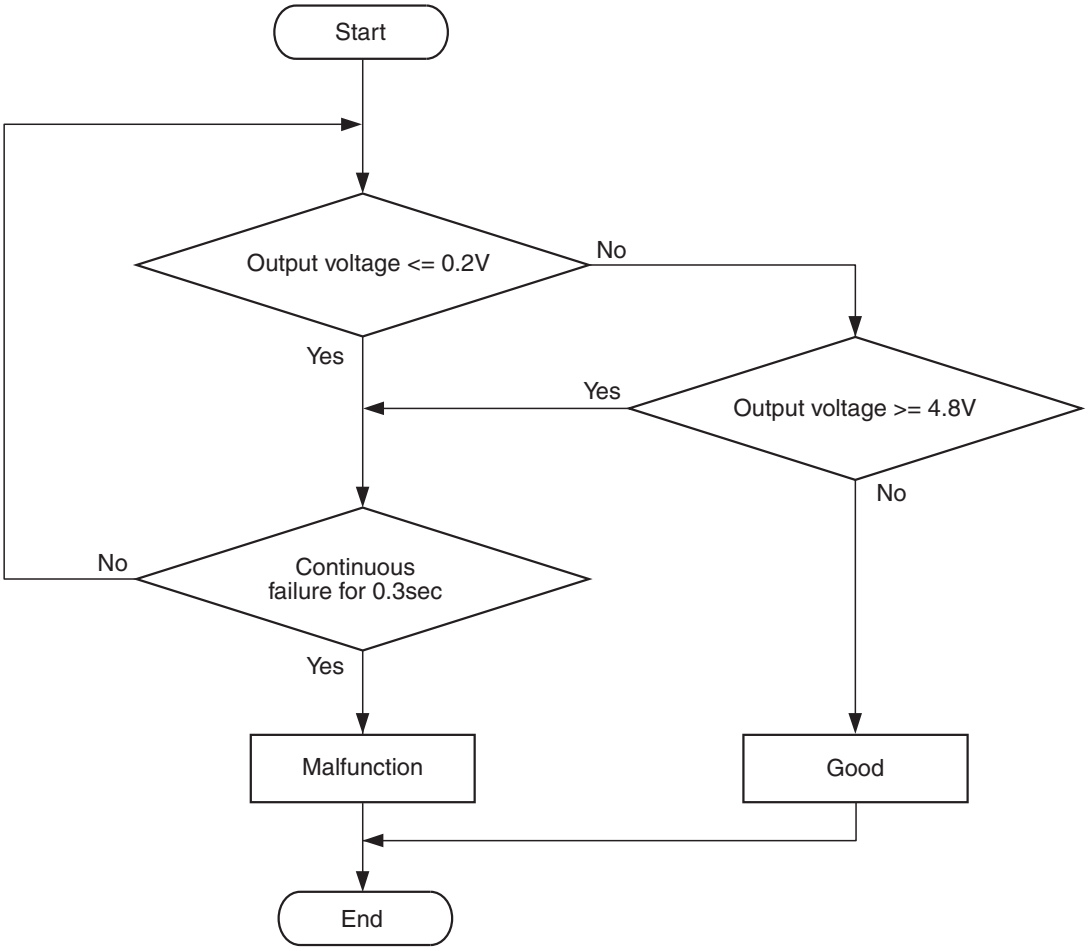
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (main) output voltage should be 4.8 volts or more for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed.
- Open throttle position sensor (main) circuit, harness damage or connector damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

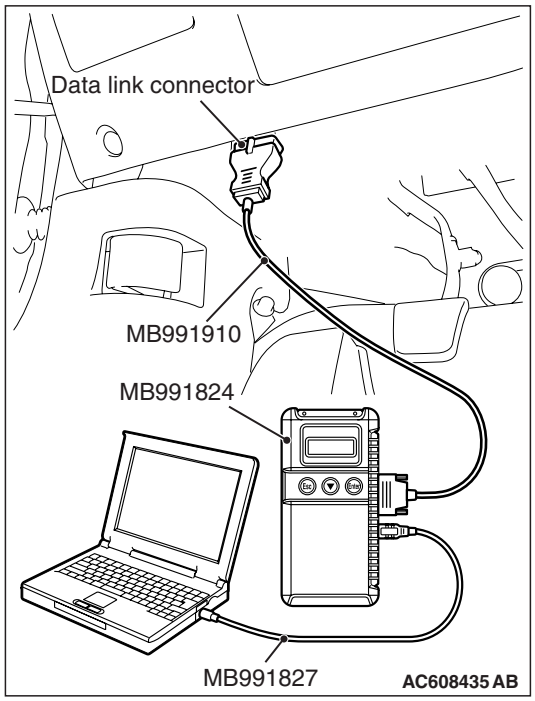
None.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

STEP 1. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
  - Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
  - Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

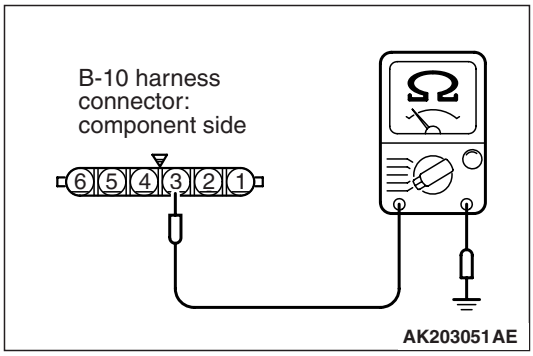
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-10 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Measure the continuity between terminal No. 3 and ground
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-10 (terminal No. 3) and ECM connector B-108 (terminal No. 13).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

STEP 7. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0123 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

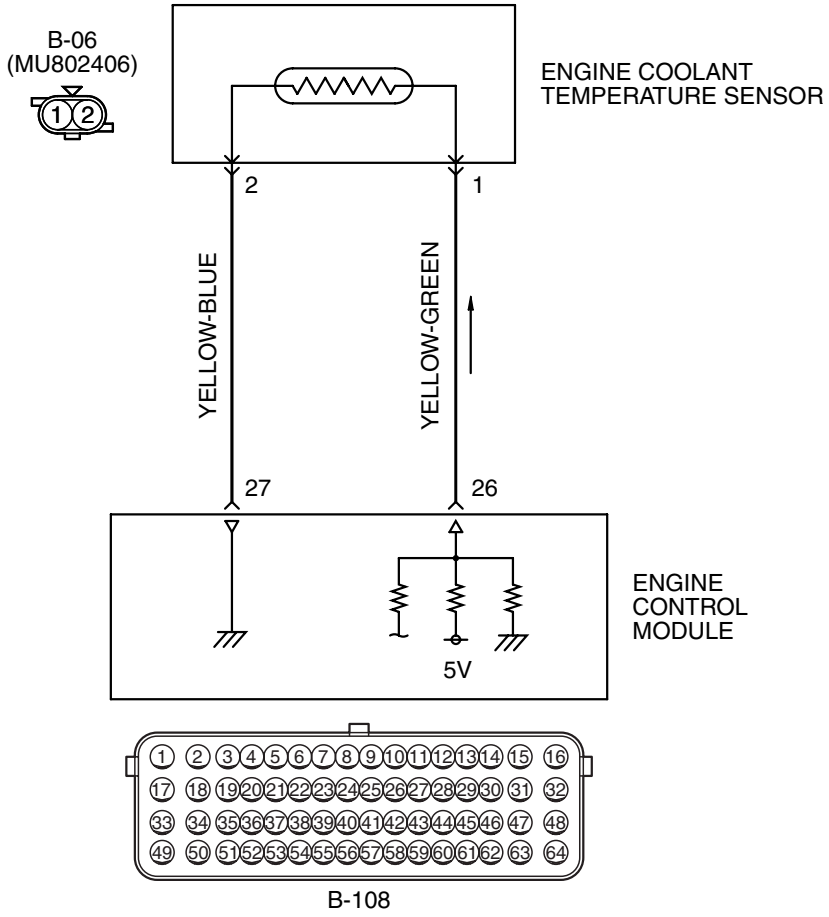
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0123 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0125: Insufficient Coolant Temperature for Closed Loop Fuel Control

ENGINE COOLANT TEMPERATURE SENSOR CIRCUIT



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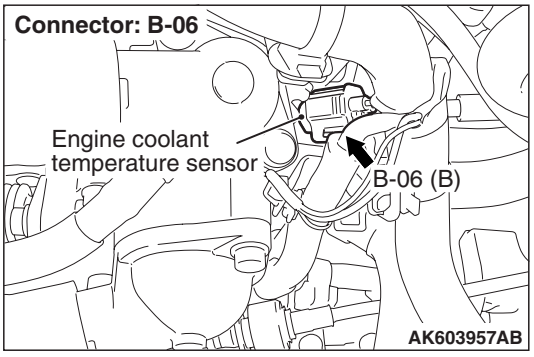
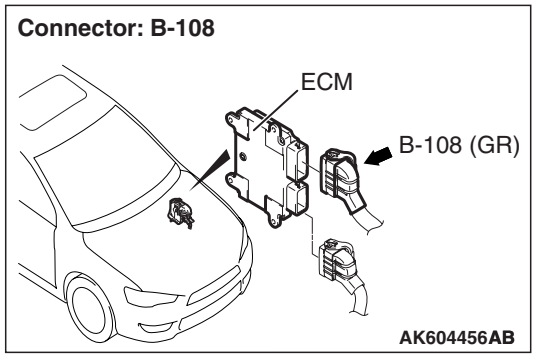




TSB Revision

CIRCUIT OPERATION

- 5-volt voltage is applied to the engine coolant temperature sensor output terminal (terminal No. 1) from the ECM (terminal No. 26) via the resistor in the ECM. The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 27).
- The engine coolant temperature sensor is a negative temperature coefficient type of resistor. It has the characteristic that when the engine coolant temperature rises the resistance decreases.
- The engine coolant temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases.

TECHNICAL DESCRIPTION

- The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

- Engine coolant temperature sensor output voltage drops from over 40° C (104° F) to under 40° C (104° F) and keeps under 40° C (104° F) for 5 minutes.
- Engine coolant temperature sensor output voltage does not reach close loop enable temperature within specified period when engine coolant temperature sensor output voltage at engine start is under 7° C (45° F).

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

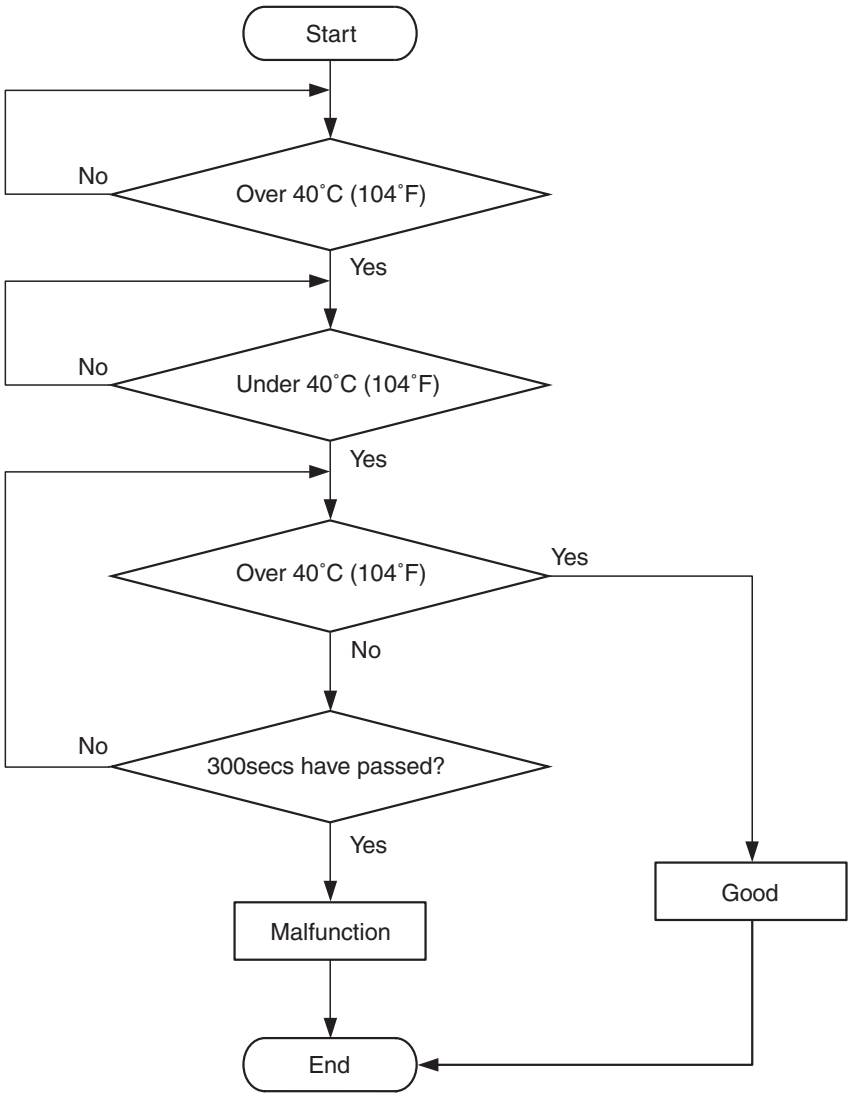
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Intake air temperature sensor

DTC SET CONDITIONS <Range/Performance problem –drift>

Logic Flow Chart



AK604319

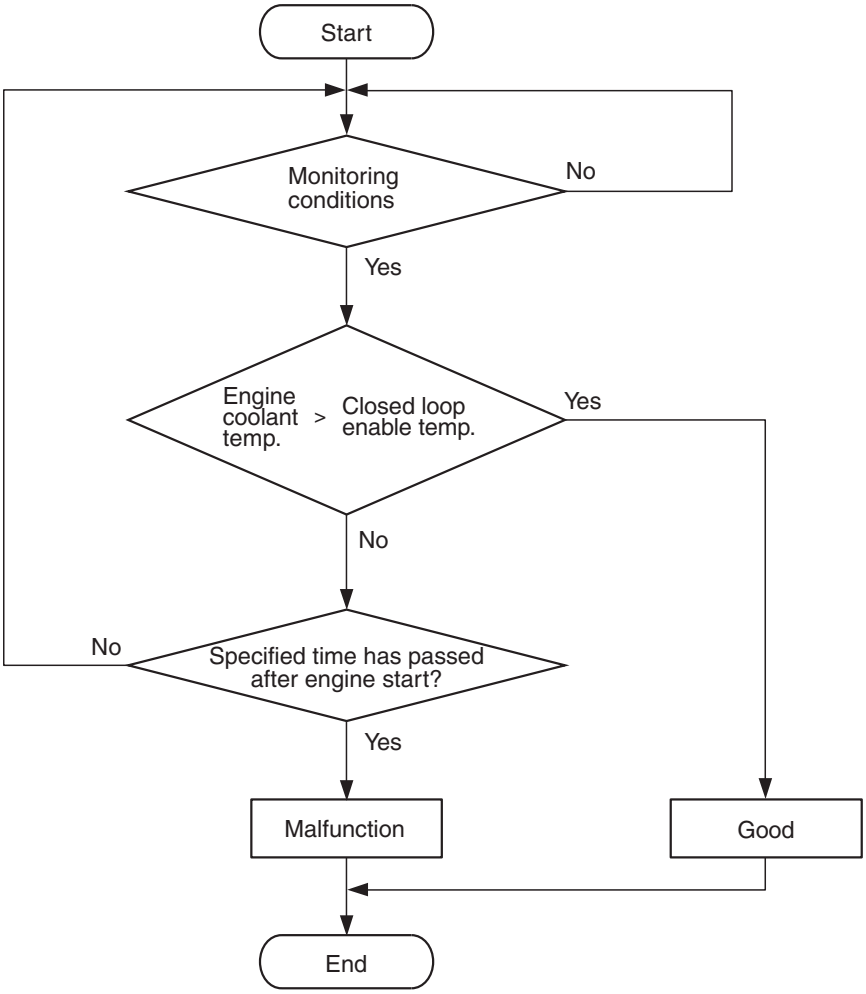
Check Conditions, Judgement Criteria

- Engine coolant temperature decreases from higher than 40° C (104° F) to lower than 40° C (104° F).
- Then the engine coolant temperature has continued to be 40° C (104° F) or lower for 5 minutes.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem –low input (Time to reach closed loop temperature)>

Logic Flow Chart



AK604320

Check Conditions, Judgement Criteria

- About 90 –300 seconds have passed for the engine coolant temperature to rise to about 7° C (45° F) after starting sequence was completed.
- However, time is not counted when fuel is shut off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 9 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine coolant temperature sensor failed.
- Harness damage in engine coolant temperature sensor circuit or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

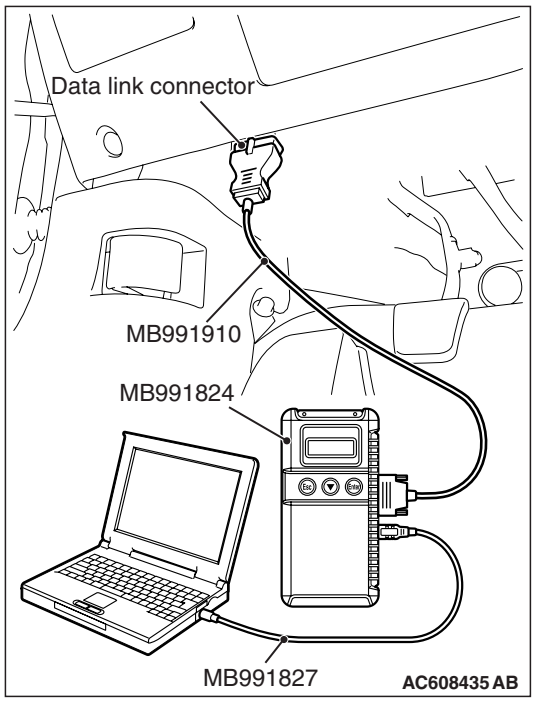
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
  - The engine coolant temperature and temperature shown with the scan tool should approximately match.

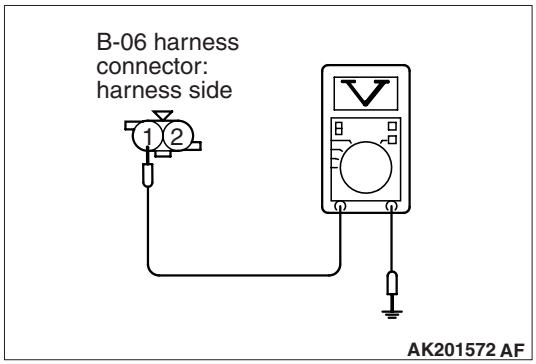
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.





STEP 2. Measure the sensor output voltage at engine coolant temperature sensor connector B-06 by backprobing.

(1) Do not disconnect the connector B-06.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When engine coolant temperature is –20° C (-4° F), voltage should be between 3.9 and 4.5 volts.
- When engine coolant temperature is 0° C (32° F), voltage should be between 3.2 and 3.8 volts.
- When engine coolant temperature is 20° C (68° F), voltage should be between 2.3 and 2.9 volts.
- When engine coolant temperature is 40° C (104° F), voltage should be between 1.3 and 1.9 volts.
- When engine coolant temperature is 60° C (140° F), voltage should be between 0.7 and 1.3 volts.
- When engine coolant temperature is 80° C (176° F), voltage should be between 0.3 and 0.9 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-06 at the engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

TSB Revision

STEP 5. Check harness connector B-06 at engine coolant temperature sensor for damage.

Q: Is the harness connector in good condition?

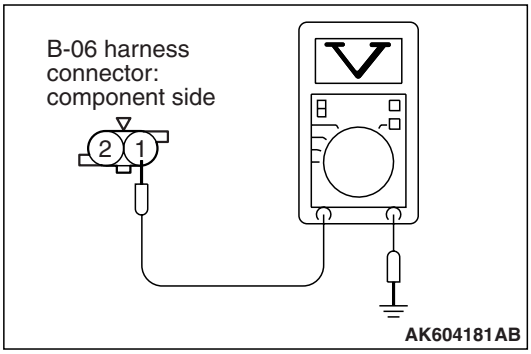
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 6. Measure the sensor supply voltage at engine coolant temperature sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 8.

NO : Go to Step 7.

STEP 7. Check harness connector B-108 at ECM for damage.

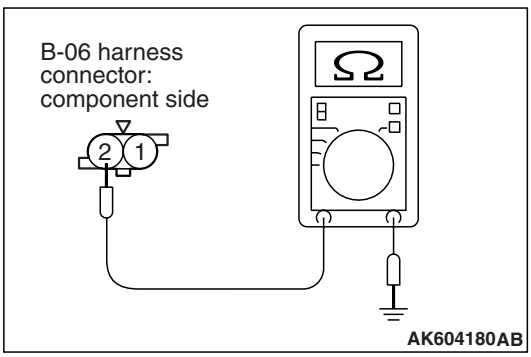
Q: Is the harness connector in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check the continuity at engine coolant temperature sensor harness side connector B-06.

(1) Disconnect the connector B-06 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 11.

NO : Go to Step 9.

STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Check for harness damage between engine coolant temperature sensor connector B-06 (terminal No. 2) and ECM connector B-108 (terminal No. 27).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

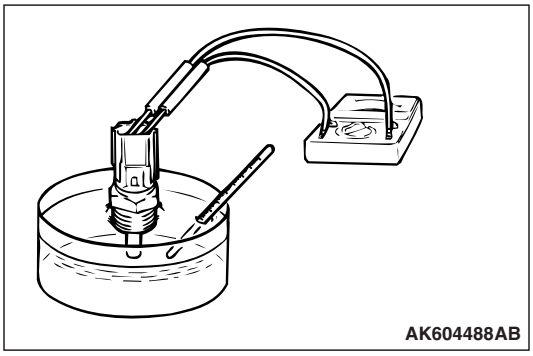
NO : Repair it. Then go to Step 14.

STEP 11. Check the engine coolant temperature sensor.

(1) Disconnect the engine coolant temperature sensor connector B-06.

(2) Remove the engine coolant temperature sensor.

(3) With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.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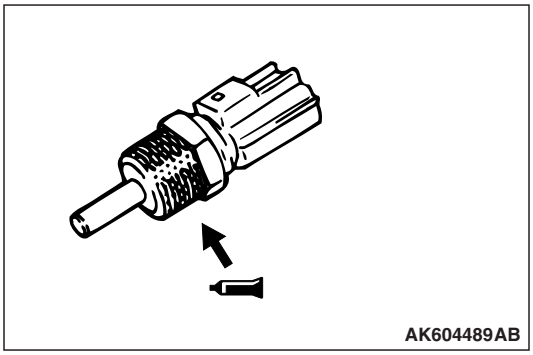
Standard value:

14 – 17 kΩ [at -20° C (-4° F)]
5.1 – 6.5 kΩ [at 0° C (32° F)]
2.1 – 2.7 kΩ [at 20° C (68° F)]
0.9 – 1.3 kΩ [at 40° C (104° F)]
0.48 – 0.68 kΩ [at 60° C (140° F)]
0.26 – 0.36 kΩ [at 80° C (176° F)]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(4) Apply 3M™ AAD part number 8731 or equivalent on the screw section of the engine coolant temperature sensor.

(5) Install the engine coolant temperature sensor, and tighten to the specified torque.

Tightening torque: 30 ±9 N· m (22 ±6 ft-lb)

Q: Is the measured resistance at the standard value?

YES : Go to Step 12.

NO : Replace the engine coolant temperature sensor. Then go to Step 14.

STEP 12. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 13.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

TSB Revision

STEP 13. Check for harness damage between engine coolant temperature sensor connector B-06 (terminal No. 1) and ECM connector B-108 (terminal No. 26).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

NO : Repair it. Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 9 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0125 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0128: Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

TECHNICAL DESCRIPTION

- The ECM checks the time for the cooling water temperature to reach the judgement temperature.

DESCRIPTIONS OF MONITOR METHODS

Engine coolant temperature does not reach 77°C (171°F) within specified period after cold start.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

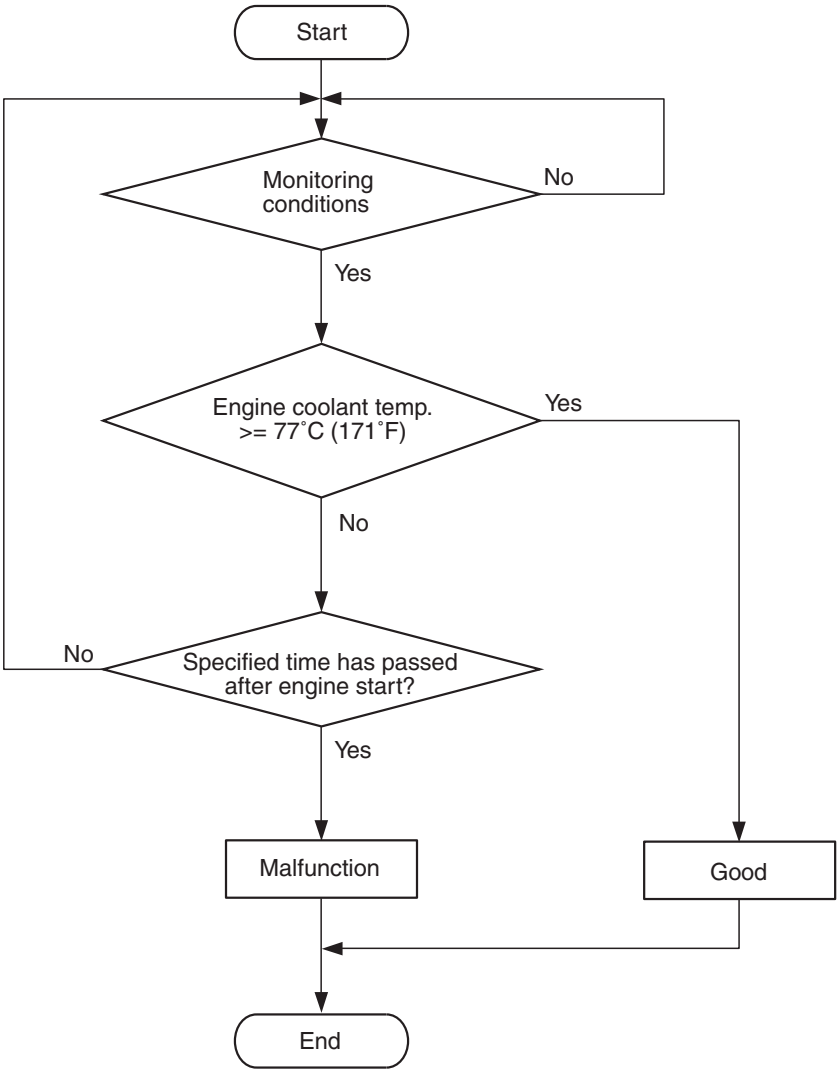
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine coolant temperature is between –10° C (14° F) and 60° C (140° F) when the engine is started.
- Intake air temperature is –10° C (14° F) or higher when the engine is started.
- The intake air temperature when the engine is started –intake air temperature is 5° C (9° F) or less.
- The total time of the mass airflow sensor output whose state is below 14 g/sec within 550 seconds.

Judgement Criteria

- The time for the engine coolant temperature to rise to 77° C (171° F) takes longer than approximately 9.5 to 43.5 minutes.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 10 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- The engine cooling system is faulty.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check the cooling system.
Refer to GROUP 14, Engine Cooling Diagnosis P.14-3.

Q: Is the cooling system normal?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 2.

NO : Repair it. Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 10 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

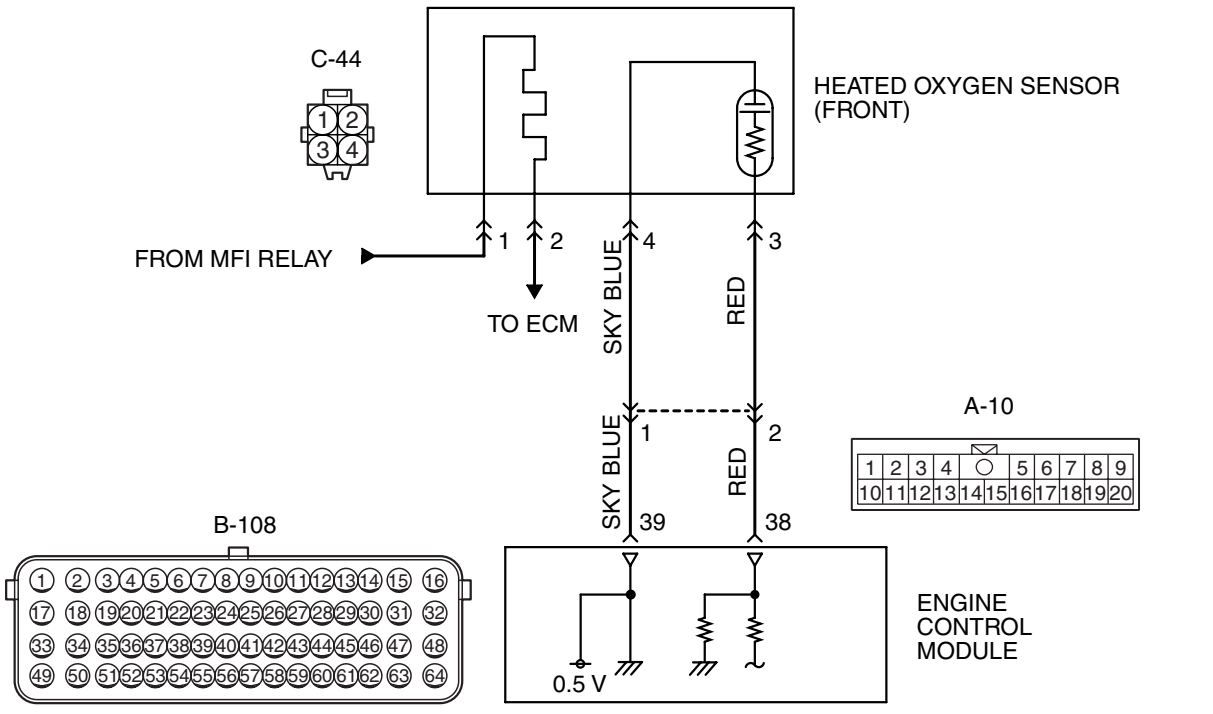
Q: Is DTC P0128 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0131: Heated Oxygen Sensor (front) Circuit Low Voltage <Except for California>

HEATED OXYGEN SENSOR (FRONT) CIRCUIT <EXCEPT FOR CALIFORNIA>



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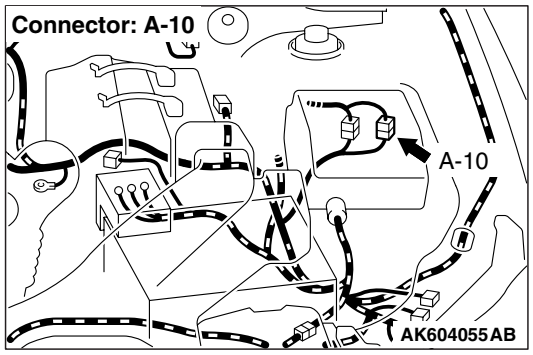
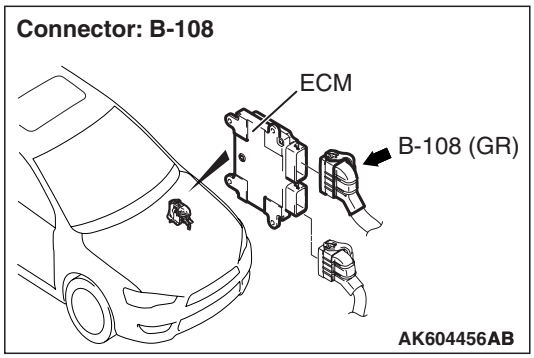
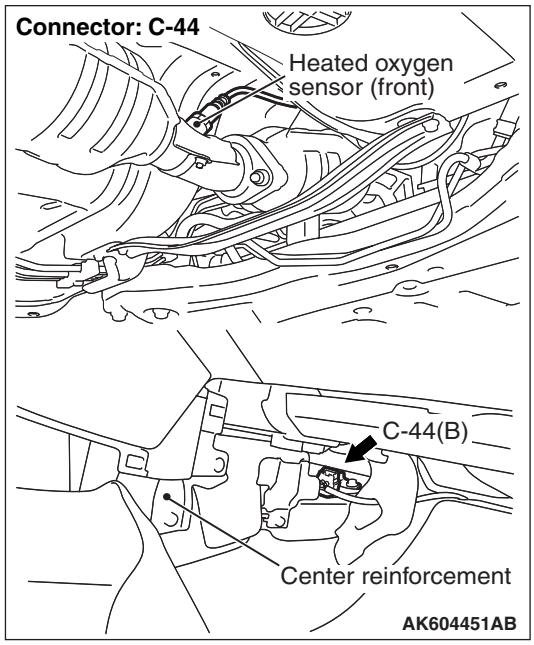
TSB Revision







CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 3) of the heated oxygen sensor (front).
- Terminal No. 4 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

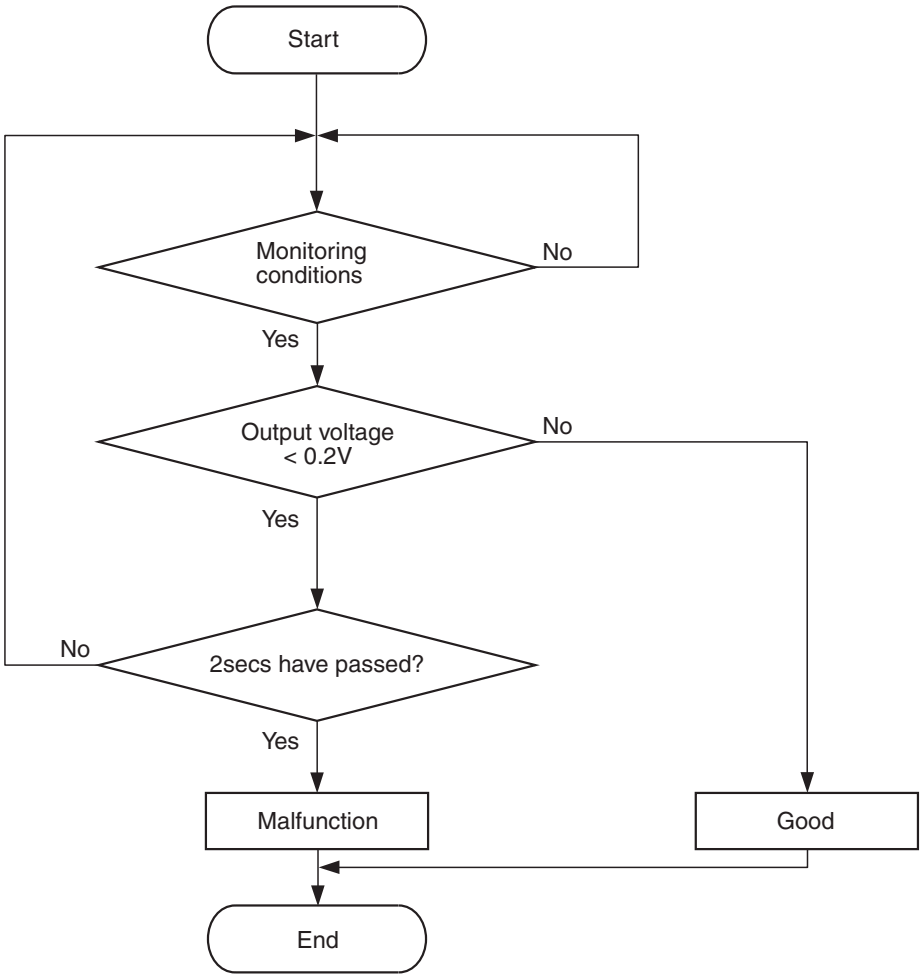
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604321

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 60 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor (front) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) failed.
- Open or shorted circuit in heated oxygen sensor (front) output line, or harness damage.
- Open circuit in heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- ECM failed.

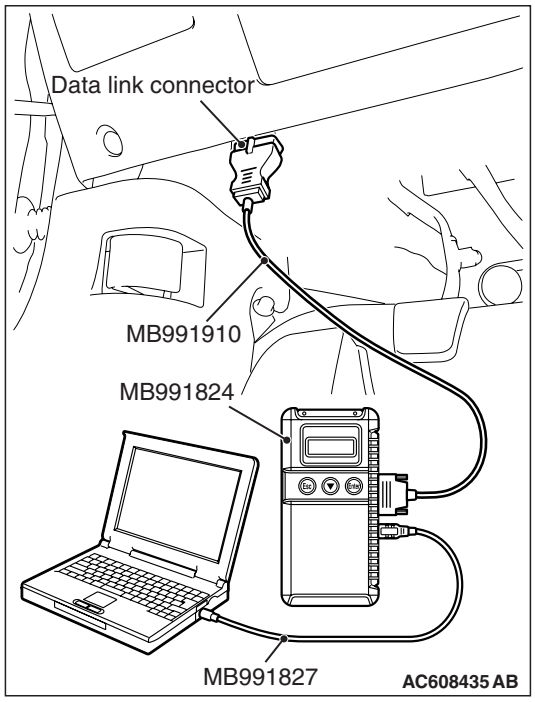
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).



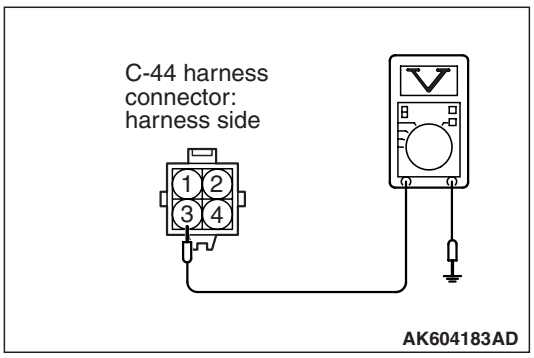
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (front) connector C-44 by backprobing



(1) Do not disconnect the connector C-44.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 3 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Check harness connector B-108 at the ECM for damage.

Q: Is the harness connector in good condition?

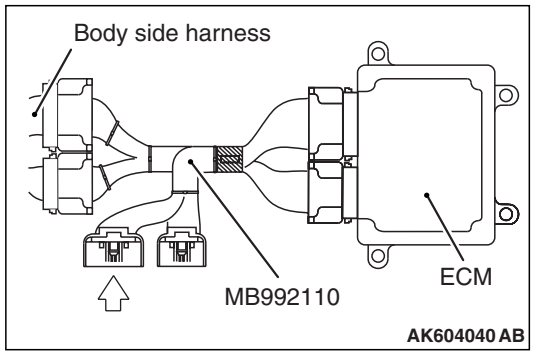
YES : Go to Step 4.

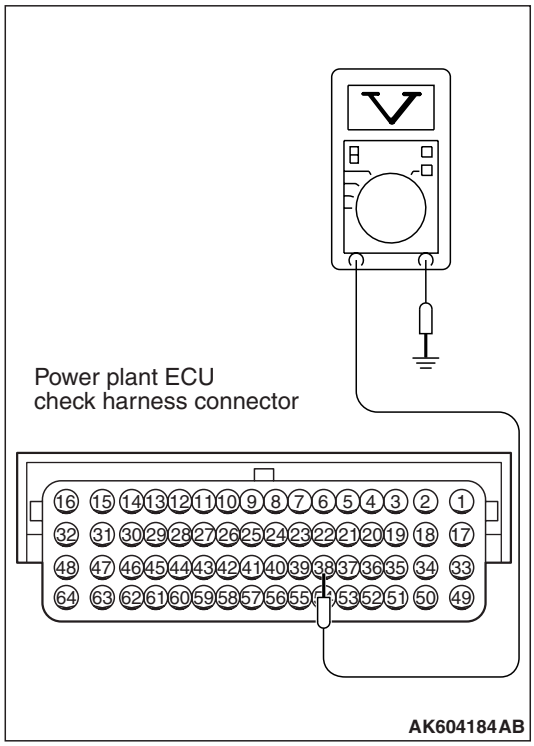
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 38 and ground.

- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 5.

NO : Go to Step 7.

STEP 5. Check harness connector C-44 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 6. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

STEP 7. Check harness connector C-44 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between heated oxygen sensor (front) connector C-44 (terminal No. 3) and ECM connector B-108 (terminal No. 38) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check harness connector C-44 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 9. Check harness connector B-108 at the ECM for damage.

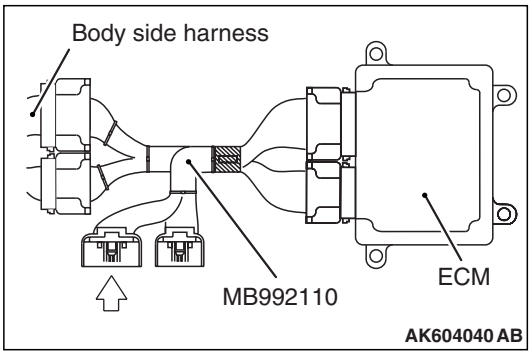
Q: Is the harness connector in good condition?

YES : Go to Step 10.

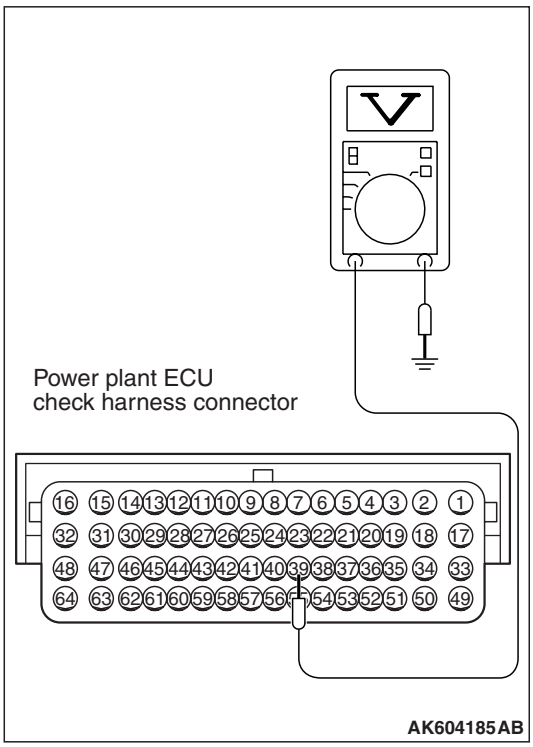
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

TSB Revision

STEP 10. Measure the sensor offset voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 39 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volts?

YES : Go to Step 11.

NO : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between headed oxygen sensor (front) connector C-44 (terminal No. 4) and ECM connector B-108 (terminal No. 39) because of open circuit or harness damage. Then go to Step 14.

STEP 11. Check for harness damage between heated oxygen sensor (front) connector C-44 (terminal No. 4) and ECM connector B-108 (terminal No. 39).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

STEP 12. Check for short circuit to ground and harness damage between heated oxygen sensor (front) connector C-44 (terminal No. 3) and ECM connector B-108 (terminal No. 38).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

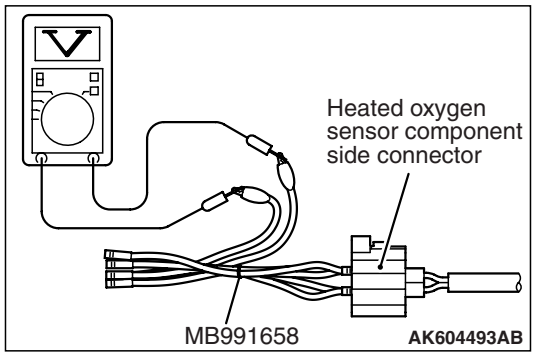
Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector C-44 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V



⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400 °C (752 °F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : Replace the heated oxygen sensor (front). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

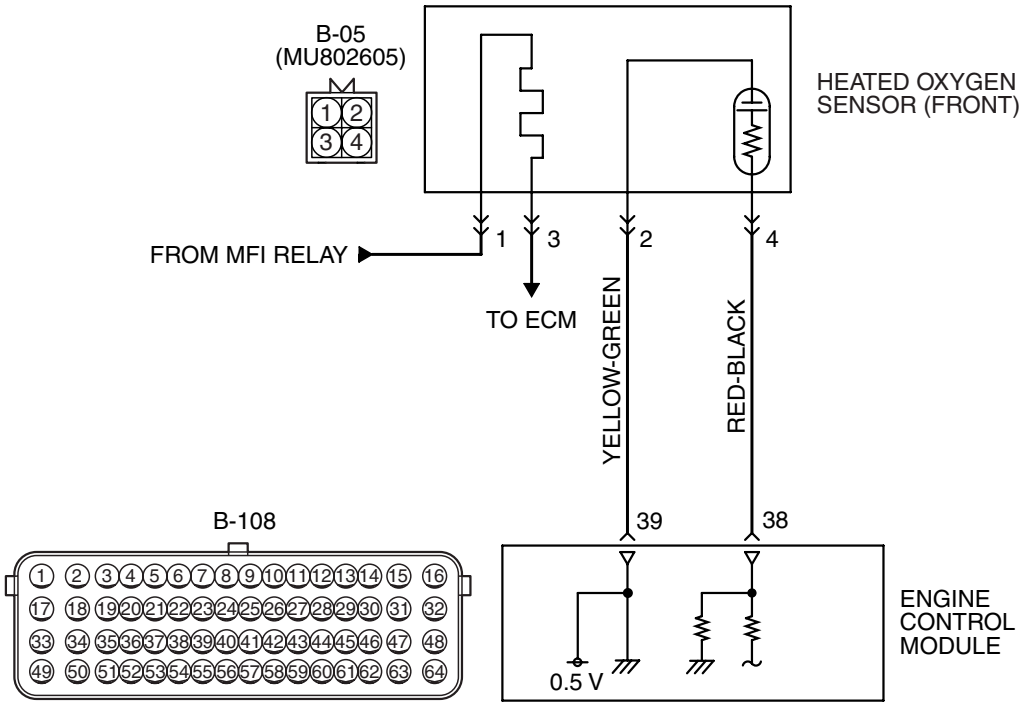
Q: Is DTC P0131 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0131: Heated Oxygen Sensor (front) Circuit Low Voltage <California>

HEATED OXYGEN SENSOR (FRONT) CIRCUIT <CALIFORNIA>



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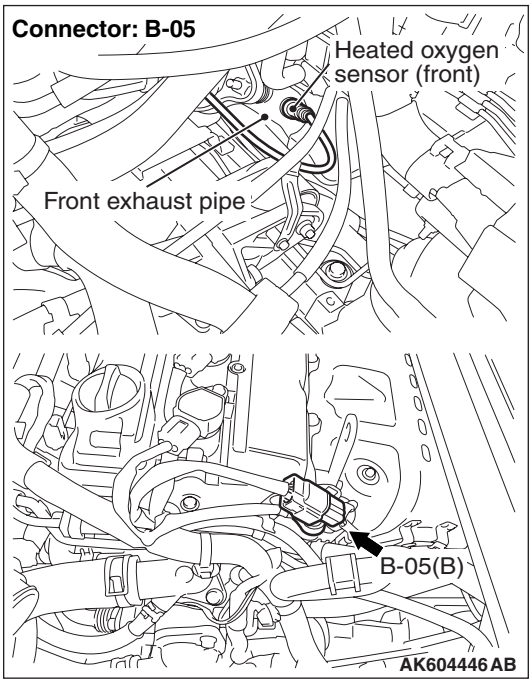
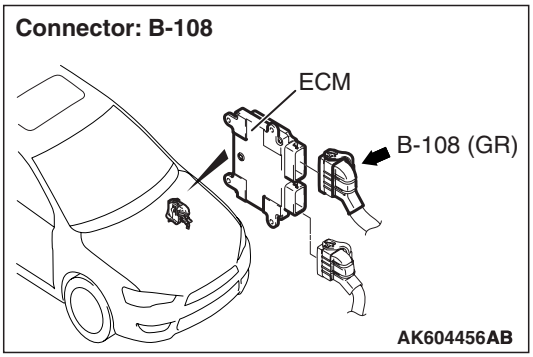




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

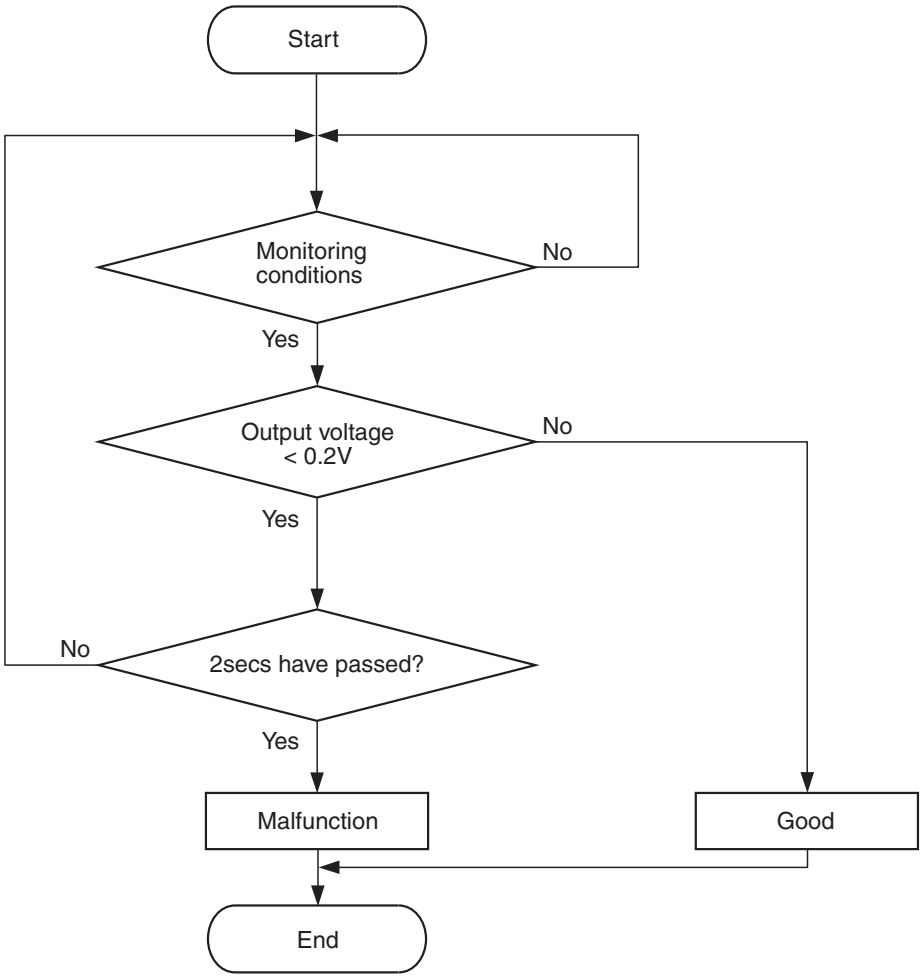
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- Typically 60 seconds have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor (front) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) failed.
- Open or shorted circuit in heated oxygen sensor (front) output line, or harness damage.
- Open circuit in heated oxygen sensor (front) ground line, or harness damage.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

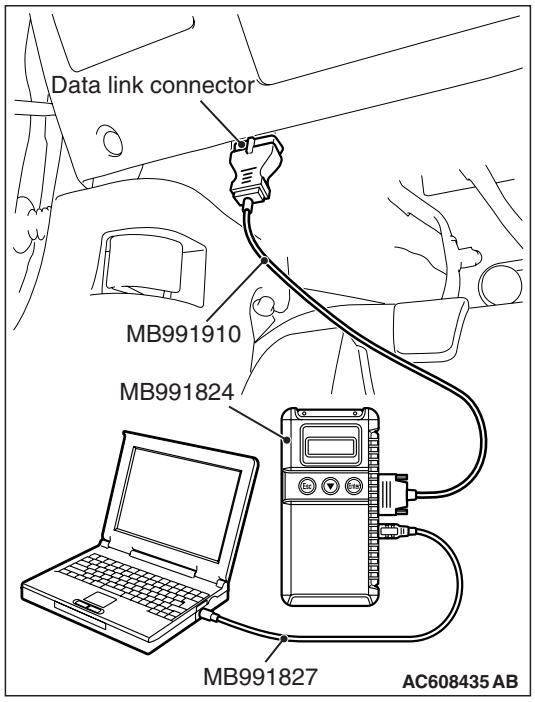
Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

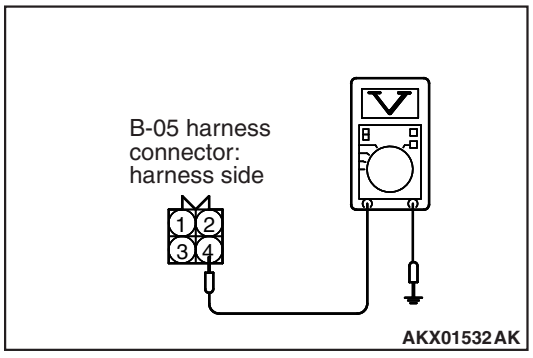


(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
  - Warm up the engine. When the engine is revved, the output voltage should measure 0.6 to 1.0 volt.
  - Warm up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (front) connector B-05 by backprobing



(1) Do not disconnect the connector B-05.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 4 and ground by backprobing.
  - Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Check harness connector B-108 at the ECM for damage.

Q: Is the harness connector in good condition?

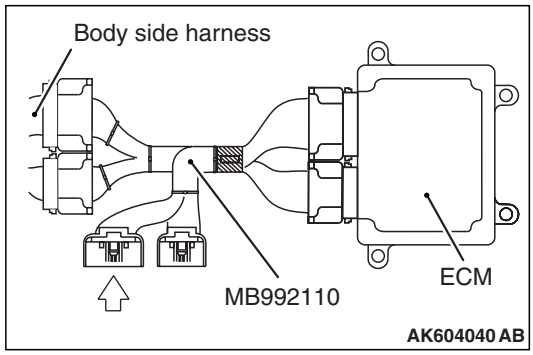
YES : Go to Step 4.

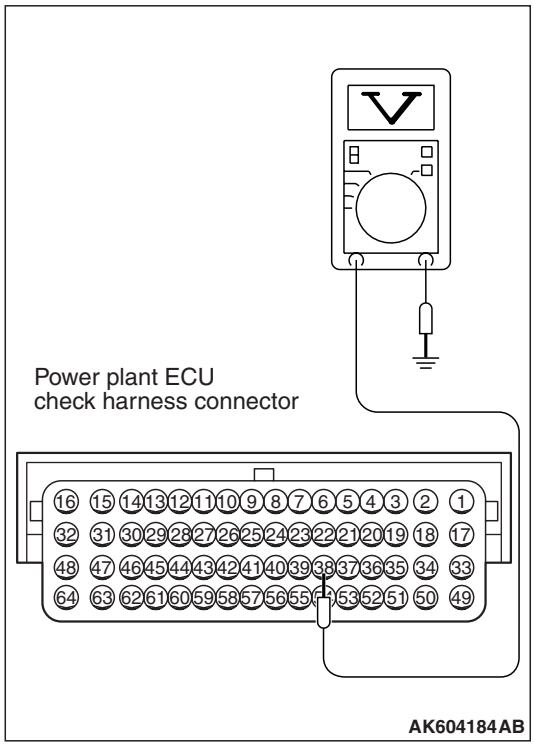
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 38 and ground.

- Warm up the engine. When the engine is 2,500 r/min, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 5.

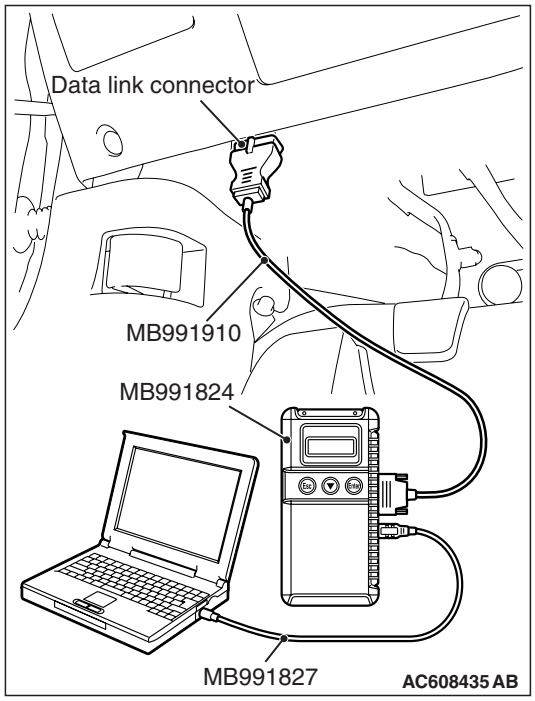
NO : Go to Step 7.

STEP 5. Check harness connector B-05 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
- Warming up the engine. When the engine is revved, the output voltage should be 0.6 to 1.0 volt.
- Warming up the engine. When the engine is idling, the output voltage should repeat 0.4 volt or less and 0.6 to 1.0 volt alternately.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

STEP 7. Check harness connector B-05 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between heated oxygen sensor (front) connector B-05 (terminal No. 4) and ECM connector B-108 (terminal No. 38) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check harness connector B-05 at heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

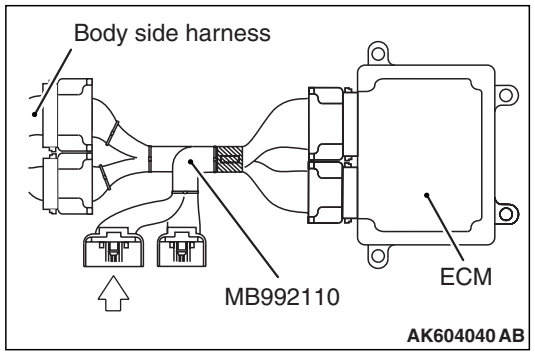
STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

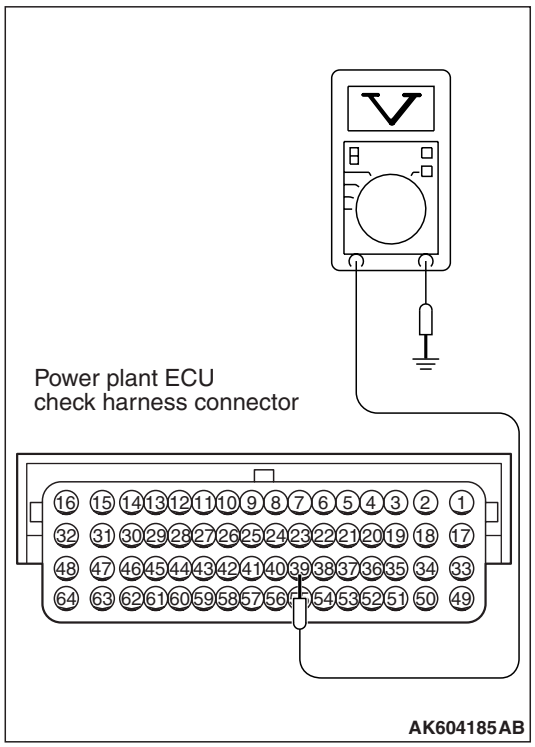
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Measure the sensor offset voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 39 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 11.
NO : Repair harness wire between heated oxygen sensor (front) connector B-05 (terminal No. 2) and ECM connector B-108 (terminal No. 39) because of open circuit or harness damage. Then go to Step 14.

STEP 11. Check for harness damage between heated oxygen sensor (front) connector B-05 (terminal No. 2) and ECM connector B-108 (terminal No. 39).

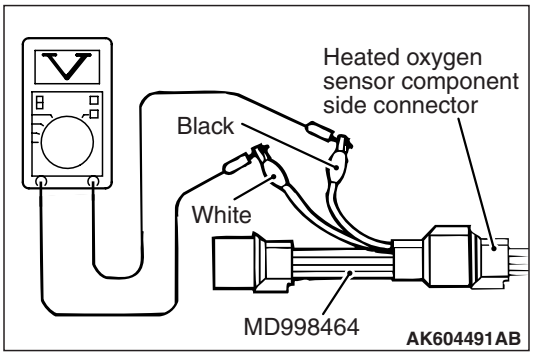
Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for short circuit to ground and harness damage between heated oxygen sensor (front) connector B-05 (terminal No. 4) and ECM connector B-108 (terminal No. 38).

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.



STEP 13. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-05 and connect test harness special tool MD998464 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : Replace the heated oxygen sensor (front). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

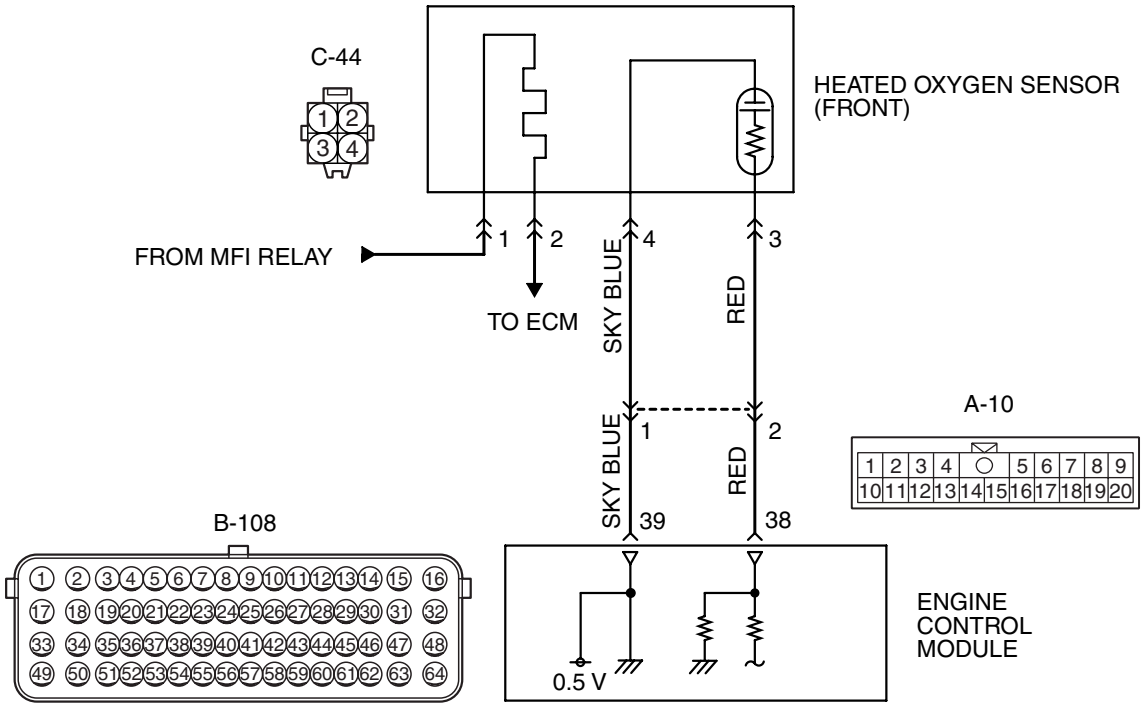
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0131 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0132: Heated Oxygen Sensor (front) Circuit High Voltage <Except for California>

HEATED OXYGEN SENSOR (FRONT) CIRCUIT <EXCEPT FOR CALIFORNIA>



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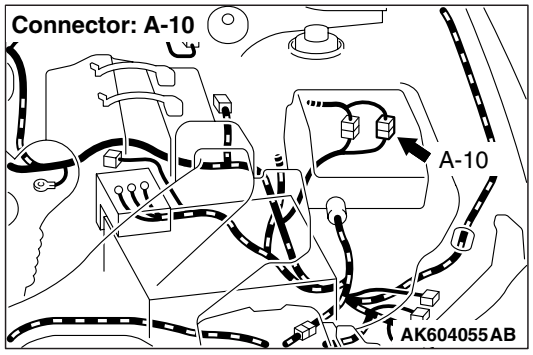

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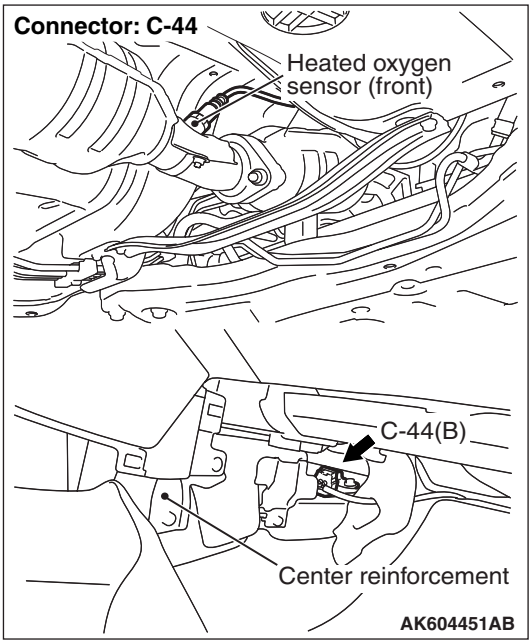

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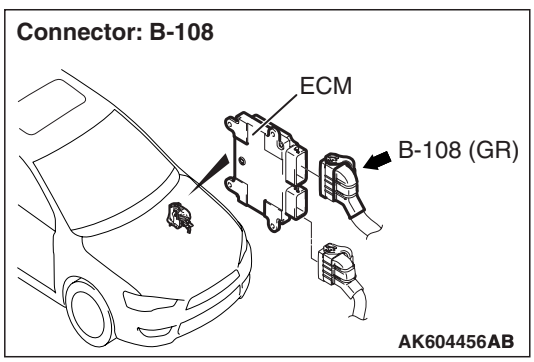

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TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 3) of the heated oxygen sensor (front).
- Terminal No. 4 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

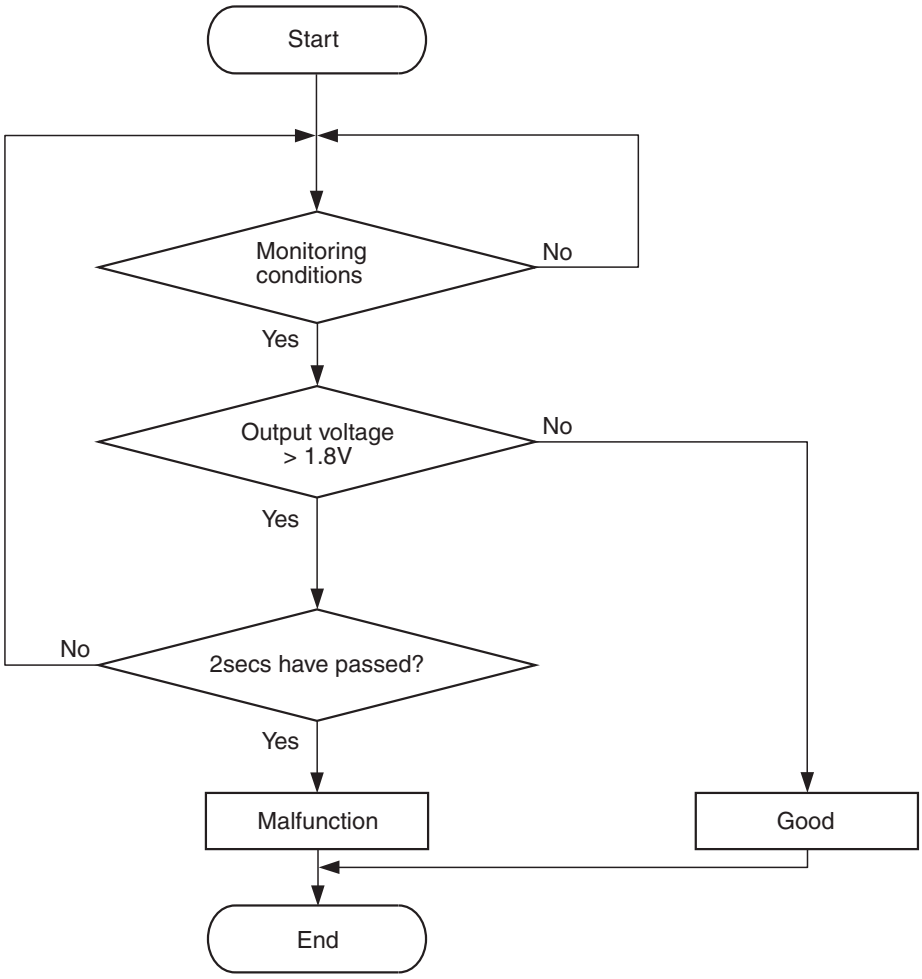
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITION

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in heated oxygen sensor (front) output line.
- Connector damage.
- ECM failed.

DIAGNOSIS

STEP 1. Check harness connector C-44 at heated oxygen sensor (front) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 2. Check for short circuit to power supply between heated oxygen sensor (front) connector C-44 (terminal No. 3) and ECM connector B-108 (terminal No. 38).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

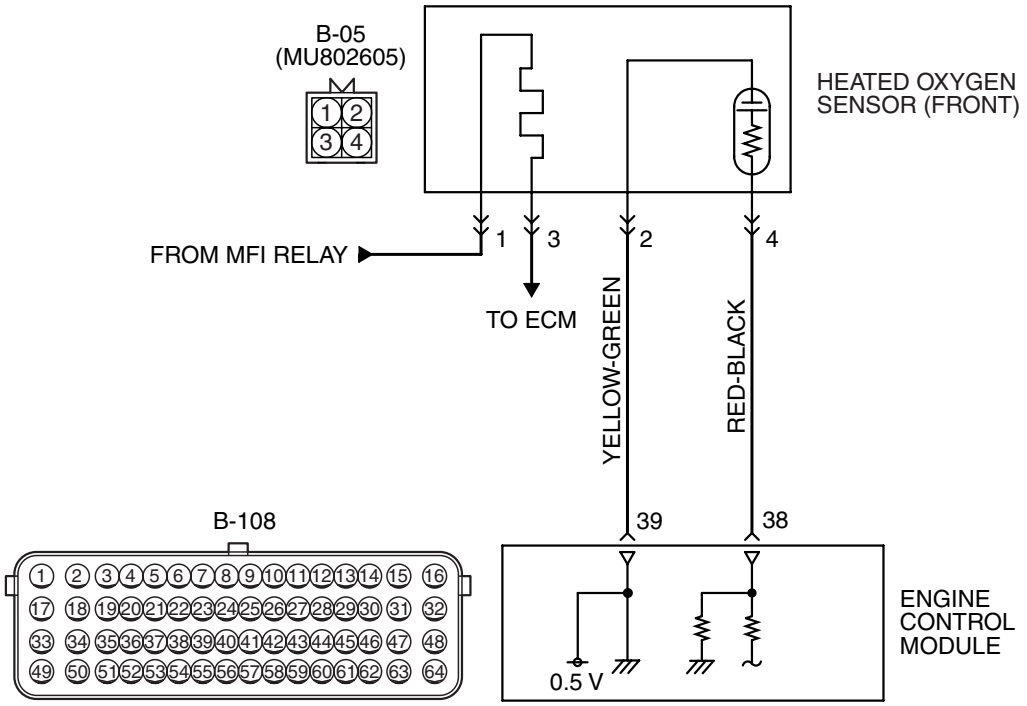
Q: Is DTC P0132 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0132: Heated Oxygen Sensor (front) Circuit High Voltage <California>

HEATED OXYGEN SENSOR (FRONT) CIRCUIT <CALIFORNIA>



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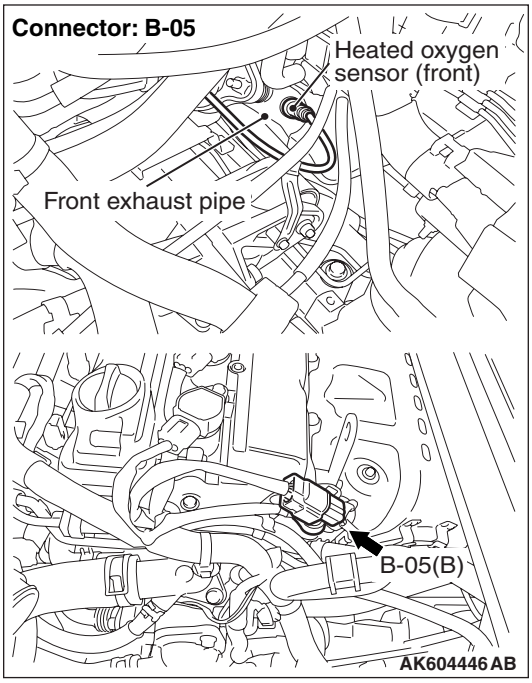

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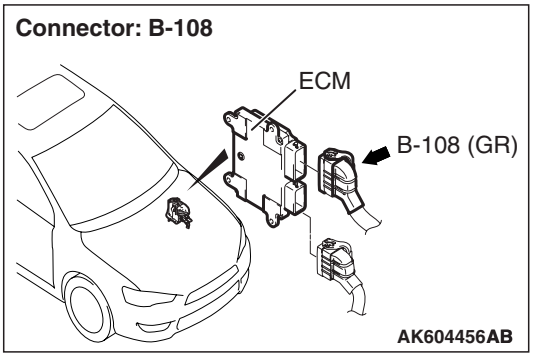


AK604456AB

TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

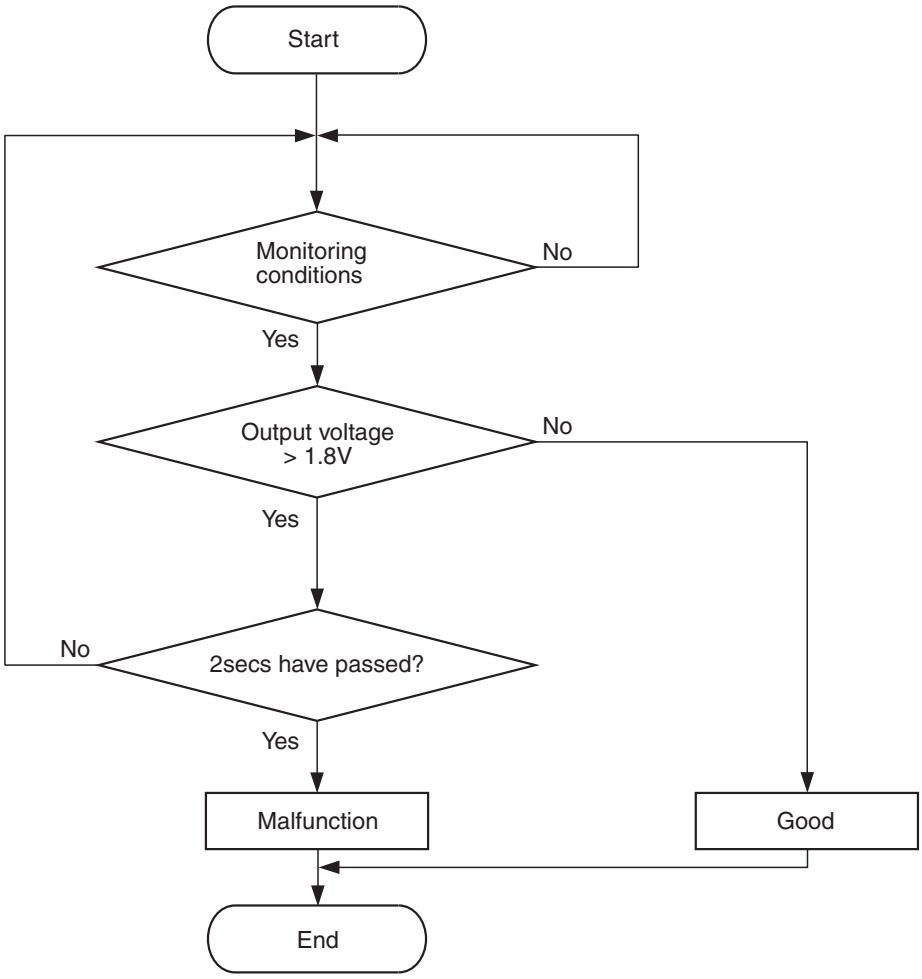
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITION

Logic Flow Chart



AK604322

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Heated oxygen sensor (front) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in heated oxygen sensor (front) output line.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check harness connector B-05 at heated oxygen sensor (front) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 2. Check for short circuit to power supply between heated oxygen sensor (front) connector B-05 (terminal No. 4) and ECM connector B-108 (terminal No. 38).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

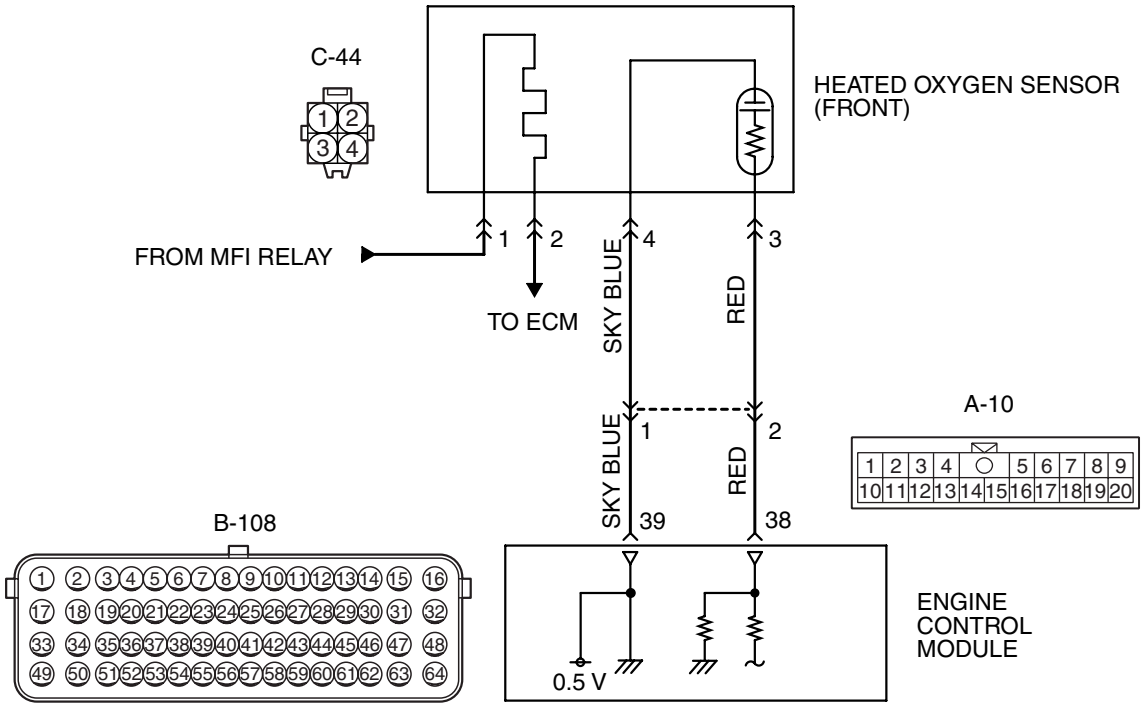
Q: Is DTC P0132 set?

YES : Retry the troubleshooting.

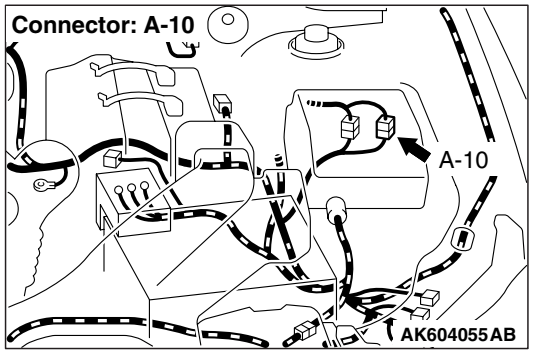
NO : The inspection is complete.

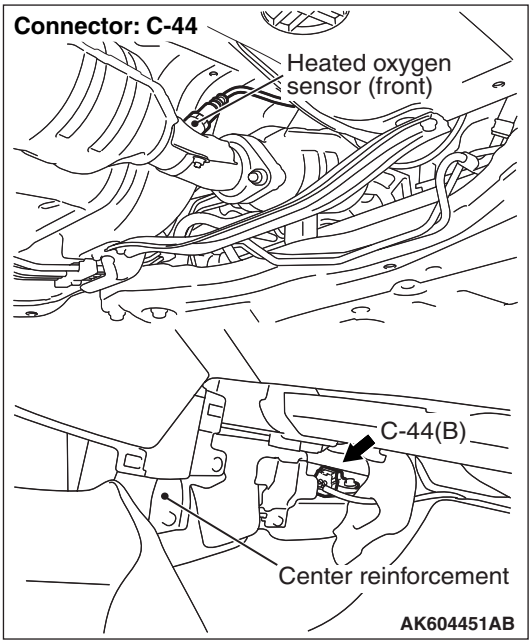
DTC P0133: Heated Oxygen Sensor (front) Circuit Slow Responce <Except for California>

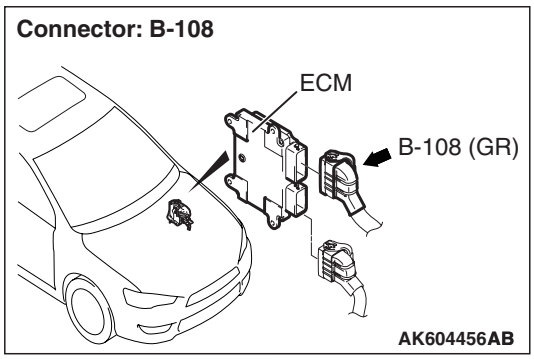
HEATED OXYGEN SENSOR (FRONT) CIRCUIT <EXCEPT FOR CALIFORNIA>



AK604239AC







TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 3) of the heated oxygen sensor (front).
- Terminal No. 4 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) rich/lean switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

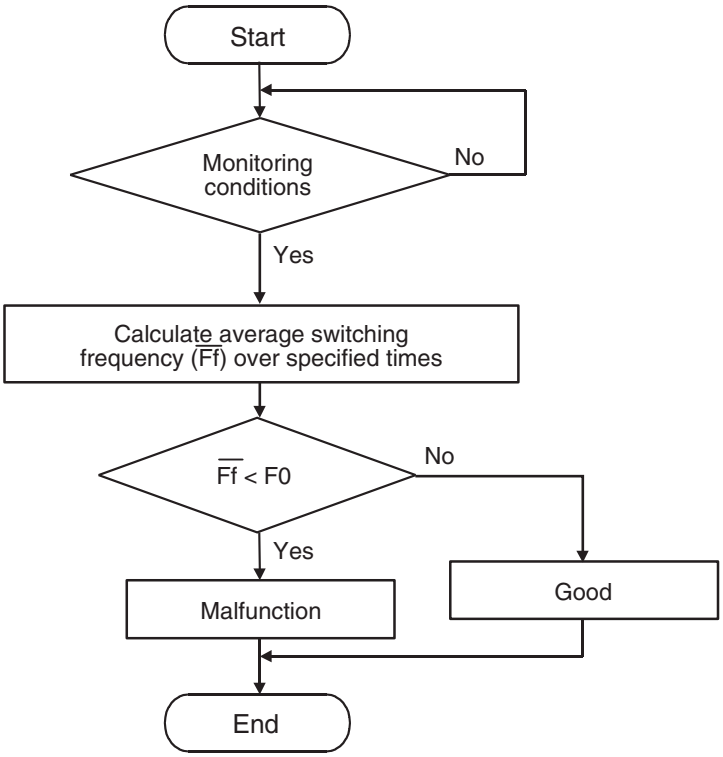
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



F0: Threshold value for average switching frequency

AK604323

Check Conditions

- Engine coolant temperature is higher than 60° C (140° F).
- Engine speed is between 1,500 and 3,500 r/min <M/T> or 1,375 and 3,000 r/min <CVT>.
- Volumetric efficiency is between 18 and 65 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is open.
- Short-term fuel trim is between –25 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The ECM monitors for this condition for 5 cycles <M/T> or 7 cycles <CVT> of 10 seconds each during the drive cycle.

Judgement Criterion

- The average of the heated oxygen sensor (front) rich/lean switching frequency is less then 8 times per 10 seconds.

or

- The heated oxygen sensor (front) rich/lean switching frequency is less than 16 times per 10 seconds.

NOTE: If the sensor switching frequency is lower than the Judgement Criteria due to the M.U.T.-III OBD-II test Mode –HO2S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 1 P.13A-10.

TSB Revision

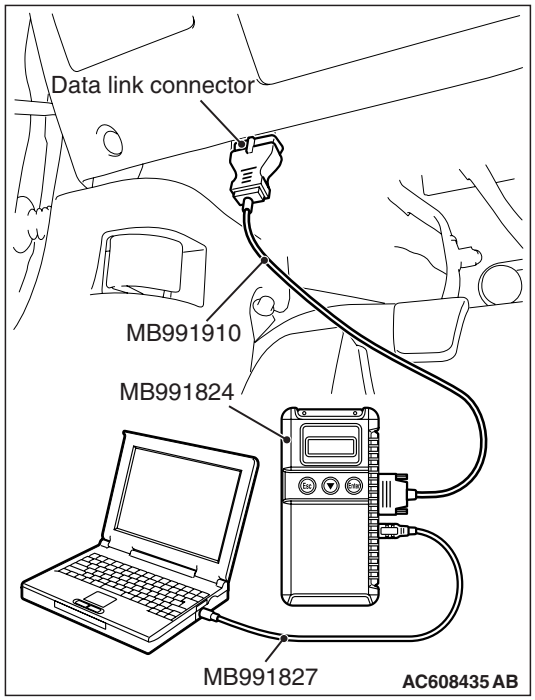
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness



STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).

⚠ CAUTION

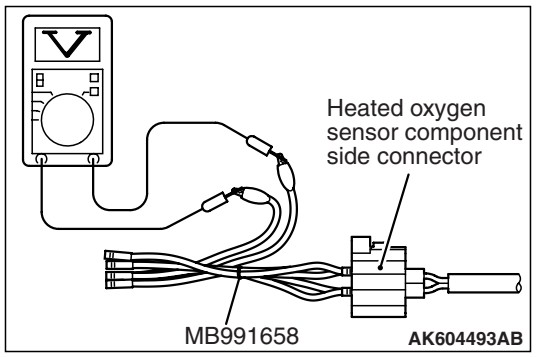
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 to 1.0 volt 8 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.



STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector C-44 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) Warm up the engine, 2,500 r/min
- Output voltage repeats 0.4 volt or less and 0.6 to 1.0 volt 8 times or more within 10 seconds.

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Replace the heated oxygen sensor (front). Then go to Step 4.

STEP 3. Check harness connector C-44 at heated oxygen sensor (front) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 1 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

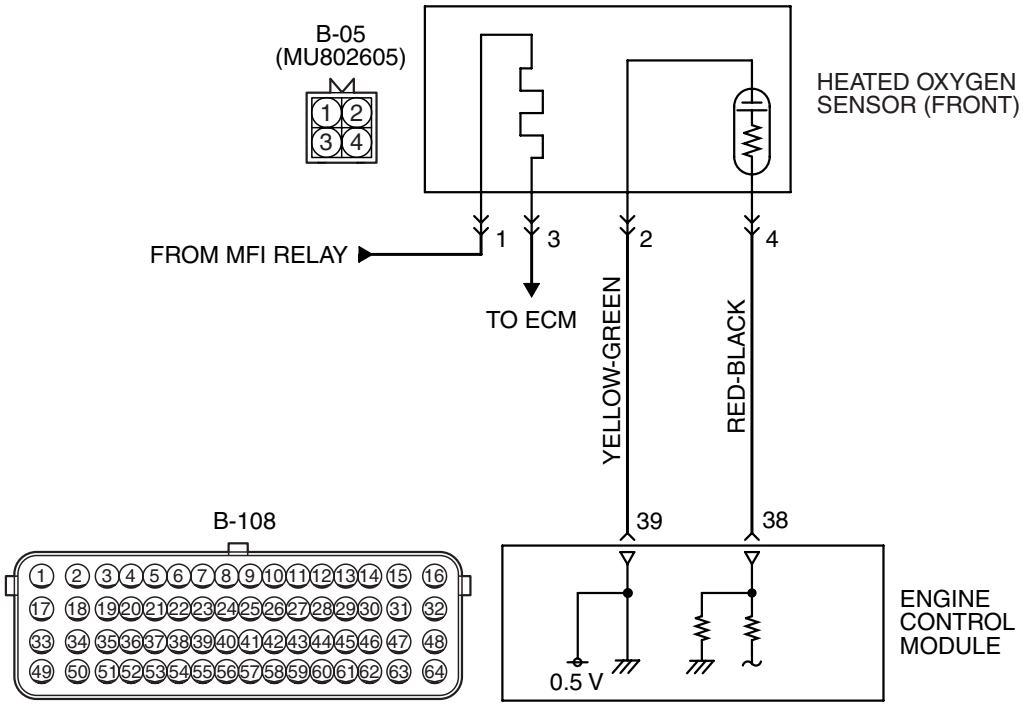
Q: Is DTC P0133 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0133: Heated Oxygen Sensor (front) Circuit Slow Responce <California>

HEATED OXYGEN SENSOR (FRONT) CIRCUIT <CALIFORNIA>



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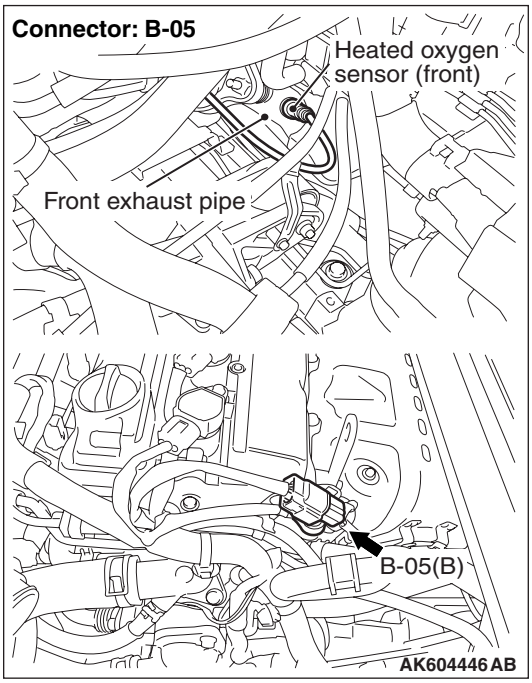
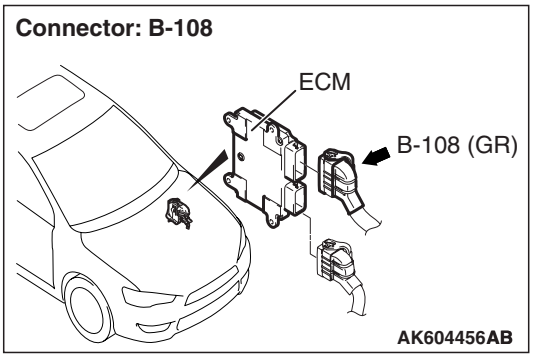




CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 38) from the output terminal (terminal No. 4) of the heated oxygen sensor (front).
- Terminal No. 2 of the heated oxygen sensor (front) is grounded with ECM (terminal No. 39).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 2 of the heated oxygen sensor (front).

TECHNICAL DESCRIPTION

- The heated oxygen sensor (front) detects the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the ECM.
- When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor signal response becomes poor.
- The ECM checks for the heated oxygen sensor (front) rich/lean switching frequency.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) rich/lean switching frequency is under specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

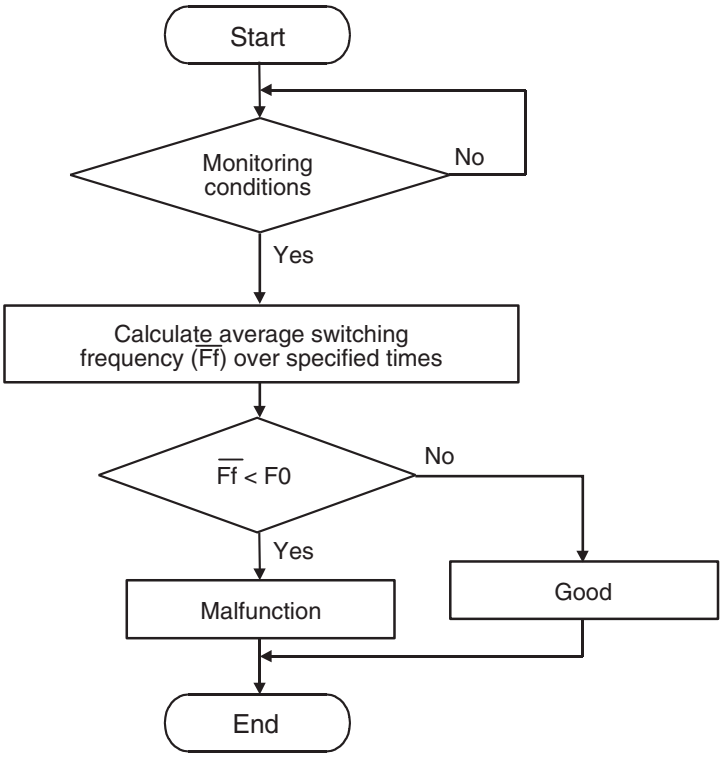
- Heated oxygen sensor heater (front) monitor
- Misfire monitor
- Fuel system monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



F0: Threshold value for average switching frequency

AK604323

Check Conditions

- Engine coolant temperature is higher than 60° C (140° F).
- Engine speed is between 1,500 and 3,500 r/min <M/T> or 1,375 and 3,000 r/min <CVT>.
- Volumetric efficiency is between 18 and 65 percent.
- Under the closed loop air/fuel control.
- The accelerator pedal is open.
- Short-term fuel trim is between –25 and +25 percent.
- More than 2 seconds have elapsed after the above mentioned conditions have been met.
- The ECM monitors for this condition for 5 cycles <M/T> or 7 cycles <CVT> of 10 seconds each during the drive cycle.

Judgement Criterion

- The average of the heated oxygen sensor (front) rich/lean switching frequency is less then 8 times per 10 seconds.

or

- The heated oxygen sensor (front) rich/lean switching frequency is less than 16 times per 10 seconds.

NOTE: If the sensor switching frequency is lower than the Judgement Criteria due to the M.U.T.-III OBD-II test Mode –HO2S Test Results, it is assumed that the heated oxygen sensor has deteriorated. If it is higher, it is assumed that the harness is damaged or has a short circuit.
If the heated oxygen sensor signal voltage has not changed even once (lean/rich) after the DTC was erased, the sensor switch time will display as 0 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 1 P.13A-10.

TSB Revision

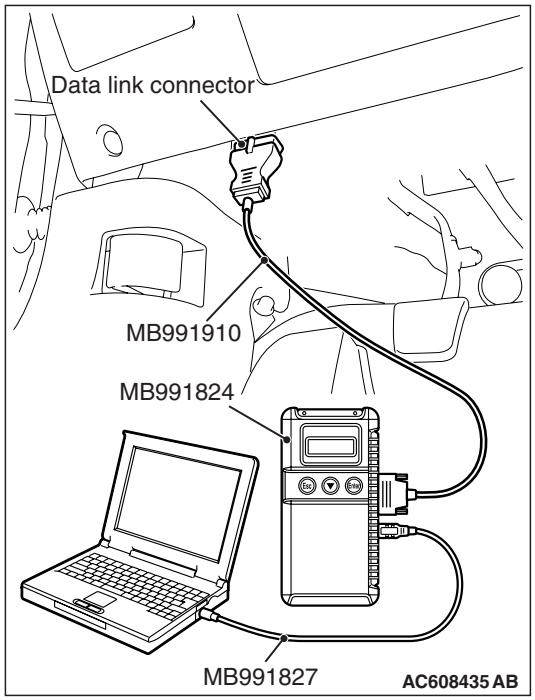
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness



STEP 1. Using scan tool MB991958, check data list item AC: Heated Oxygen Sensor (front).

⚠ CAUTION

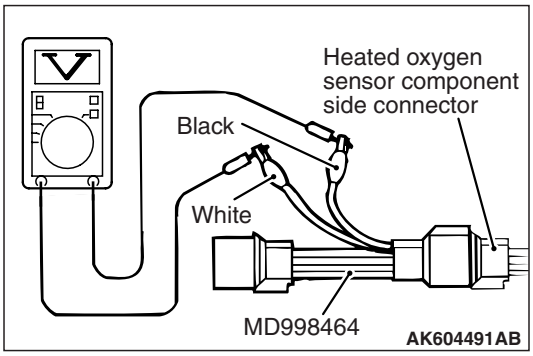
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AC, Heated Oxygen Sensor (front).
(4) Warm up the engine, 2,500 r/min.
  - Output voltage repeats 0.4 volt or less and 0.6 to 1.0 volt 8 times or more within 10 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.



STEP 2. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-05 and connect test harness special tool MD998464 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) Warm up the engine, 2,500 r/min
- Output voltage repeats 0.4 volt or less and 0.6 to 1.0 volt 8 times or more within 10 seconds.

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Replace the heated oxygen sensor (front). Then go to Step 4.

STEP 3. Check harness connector B-05 at heated oxygen sensor (front) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 4.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 1 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0133 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0134: Heated Oxygen Sensor (front) No Activity Detected <Except for California>

Heated Oxygen Sensor (front) No Activity Detected Circuit

- Refer to DTC P0131 –Heated Oxygen Sensor (Front) Circuit Low Voltage <Except for California> P.13A-229.
- Refer to DTC P0201 –Injector Circuit-cylinder 1 P.13A-367.
- Refer to DTC P0202 –Injector Circuit-cylinder 2 P.13A-377.
- Refer to DTC P0203 –Injector Circuit-cylinder 3 P.13A-387.
- Refer to DTC P0204 –Injector Circuit-cylinder 4 P.13A-397.

CIRCUIT OPERATION

- Refer to DTC P0131 –Heated Oxygen Sensor (Front) Circuit Low Voltage <Except for California> P.13A-229.
- Refer to DTC P0201 –Injector Circuit-cylinder 1 P.13A-367.
- Refer to DTC P0202 –Injector Circuit-cylinder 2 P.13A-377.
- Refer to DTC P0203 –Injector Circuit-cylinder 3 P.13A-387.
- Refer to DTC P0204 –Injector Circuit-cylinder 4 P.13A-397.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the heated oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

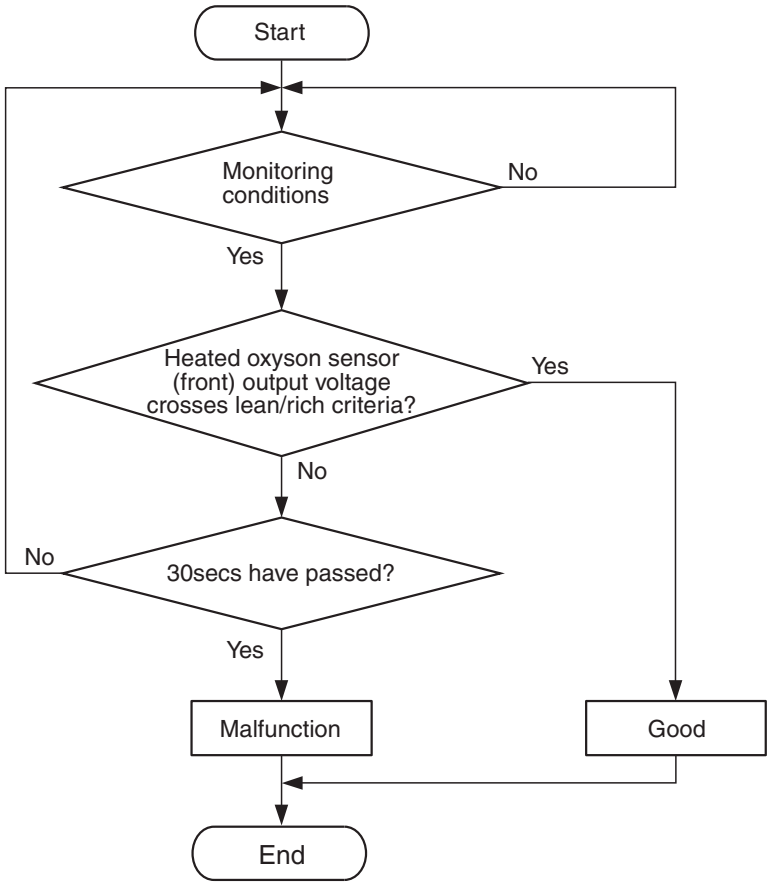
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604324

Check Conditions

- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7°C (45°F).
- Engine speed is higher than 1,188 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion

- Heated oxygen sensor (front) output voltage does not get across lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- Harness damage in heated oxygen sensor (front) output line.
- Heated oxygen sensor (rear) deteriorated.

  NOTE: When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the heated oxygen sensor (rear).
  If the heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.
- Open circuit in injector.

TSB Revision

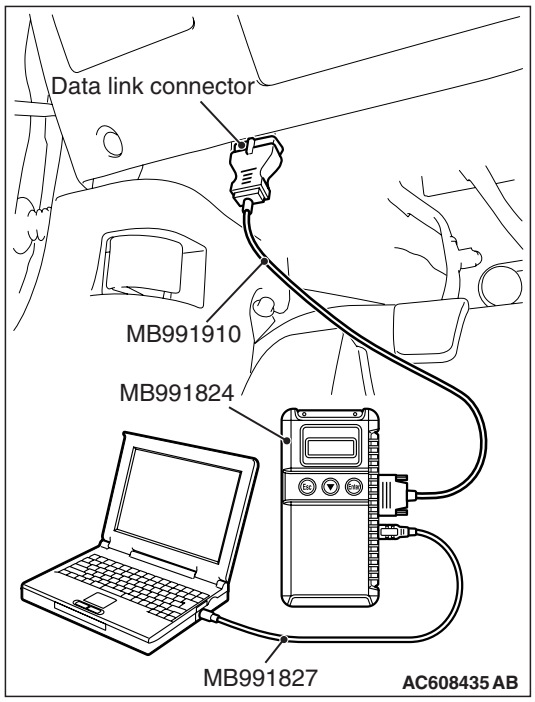
- Harness damage in injector circuit.
- Connector damage.
- ECM failed.

- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range).
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <Except for California> P.13A-274, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <Except for California> P.13A-292, DTC P0139 –Heated Oxygen Sensor (rear) Circuit Slow Response <Except for California> P.13A-300, P0140 –Heated Oxygen Sensor (rear) Circuit No Activity Detected <Except for California> P.13A-308.

STEP 2. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

STEP 4. Check harness connector C-44 at the heated oxygen sensor (front) for damage.

Q: Is the harness connector in good condition?

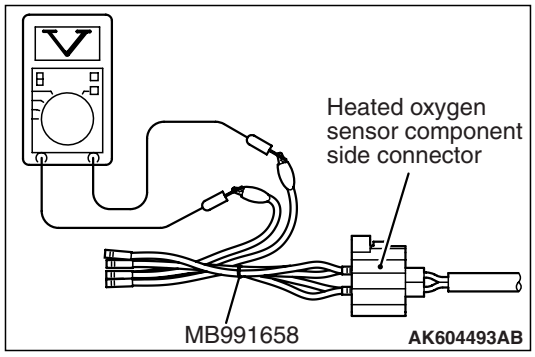
YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector C-44 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V



⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.

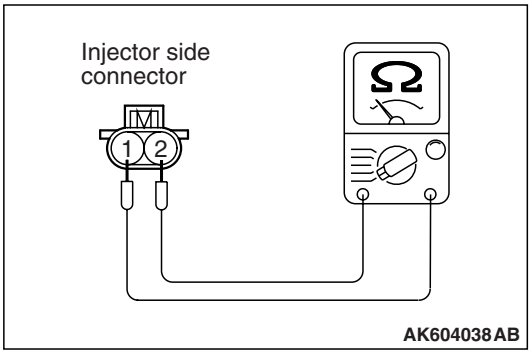
NO : Replace the heated oxygen sensor (front). Then go to Step 12.

STEP 6. Check harness connector B-101, B-102, B-103, and B-104 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.



STEP 7. Check the injectors.

(1) Disconnect each injector connector.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 8.
NO : Replace the injector. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between heated oxygen sensor (front) connector C-44 (terminal No. 3) and ECM connector B-108 (terminal No. 38).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between injector connector and ECM connector.

a. Check the harness wire between injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3) when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.
Refer to On-vehicle Service –Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 12 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0134: Heated Oxygen Sensor (front) No Activity Detected <California>

Heated Oxygen Sensor (front) No Activity Detected Circuit

- Refer to DTC P0131 –Heated Oxygen Sensor (Front) Circuit Low Voltage <California> P.13A-237.
- Refer to DTC P0201 –Injector Circuit-cylinder 1 P.13A-367.
- Refer to DTC P0202 –Injector Circuit-cylinder 2 P.13A-377.
- Refer to DTC P0203 –Injector Circuit-cylinder 3 P.13A-387.
- Refer to DTC P0204 –Injector Circuit-cylinder 4 P.13A-397.

CIRCUIT OPERATION

- Refer to DTC P0131 –Heated Oxygen Sensor (Front) Circuit Low Voltage <California> P.13A-237.
- Refer to DTC P0201 –Injector Circuit-cylinder 1 P.13A-367.
- Refer to DTC P0202 –Injector Circuit-cylinder 2 P.13A-377.
- Refer to DTC P0203 –Injector Circuit-cylinder 3 P.13A-387.
- Refer to DTC P0204 –Injector Circuit-cylinder 4 P.13A-397.

TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the heated oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P0134 becomes stored in memory if a failure is detected in the above air/fuel ratio feedback control system.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

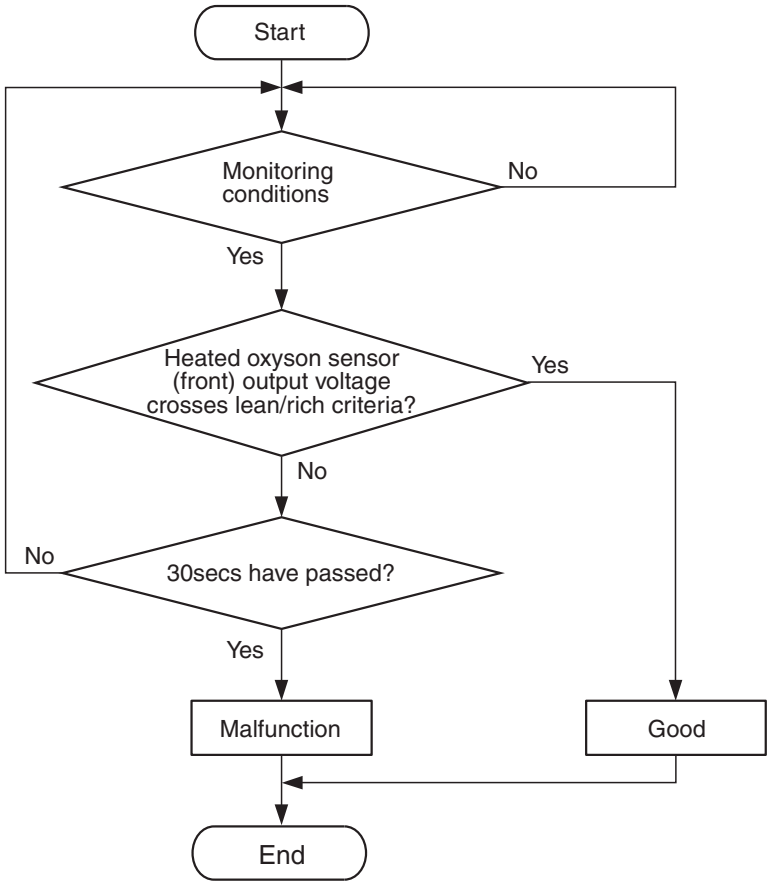
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7° C (45° F).
- Engine speed is higher than 1,188 r/min.
- Volumetric efficiency is higher than 30 percent.
- Throttle position sensor output voltage is lower than 4 volts.
- Except while fuel is being shut off.
- Monitoring time: 30 seconds.

Judgement Criterion
- Heated oxygen sensor (front) output voltage does not get across lean/rich criteria (about 0.5 volt) within about 30 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 12 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Heated oxygen sensor (front) deteriorated.
- Harness damage in heated oxygen sensor (front) output line.
- Heated oxygen sensor (rear) deteriorated.

TSB Revision

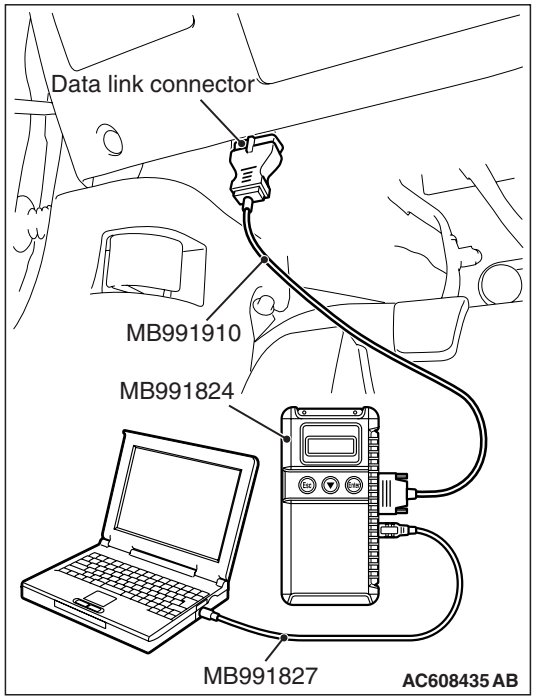
NOTE: When the heated oxygen sensor (front) begins to deteriorate, the heated oxygen sensor output voltage will deviate from the voltage when the sensor was new (normally 0.5 volt at stoichiometric ratio). This deviation will be corrected by the heated oxygen sensor (rear).
If the heated oxygen sensor (rear) responds poorly because it has deteriorated, it will improperly correct the heated oxygen sensor (front). Thus, even when closed loop control is being effected, the fluctuation of the heated oxygen sensor (front) output voltage decreases, without intersecting with 0.5 volt. As a result, there is a possibility of DTC P0134 becoming registered.

- Open circuit in injector.
- Harness damage in injector circuit.
- Connector damage.
- ECM failed.
- Exhaust leak.
- Air drawn in from gaps in gasket, seals, etc.
- Incorrect fuel pressure.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range).
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltage should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <California> P.13A-283, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <California> P.13A-296, DTC P0139 –Heated Oxygen Sensor (rear) Circuit Slow Response <California> P.13A-304, P0140 –Heated Oxygen Sensor (rear) Circuit No Activity Detected <California> P.13A-312.

STEP 2. Check for exhaust leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 12.
NO : Go to Step 4.

STEP 4. Check harness connector B-05 at the heated oxygen sensor (front) for damage.

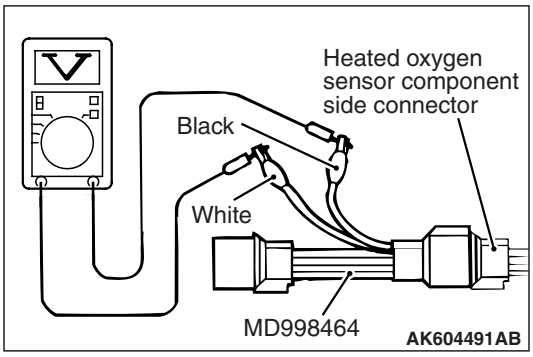
Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 5. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-05 and connect test harness special tool MD998464 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V



⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 6.
NO : Replace the heated oxygen sensor (front). Then go to Step 12.

TSB Revision

STEP 6. Check harness connector B-101, B-102, B-103 and B-104 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

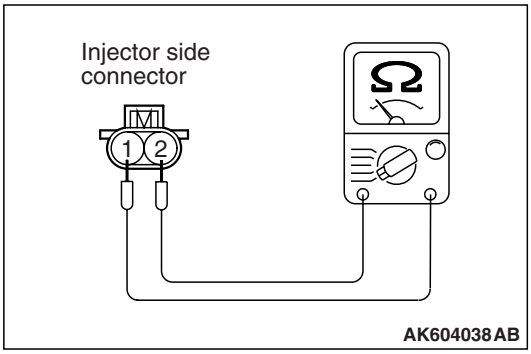
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 7. Check the injectors.

(1) Disconnect each injector connector.

(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 8.

NO : Replace the injector. Then go to Step 12.

STEP 8. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 12.

STEP 9. Check for harness damage between heated oxygen sensor (front) connector B-05 (terminal No. 4) and ECM connector B-108 (terminal No. 38).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 12.

STEP 10. Check for harness damage between injector connector and ECM connector.

a. Check the harness wire between injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) when checking No. 1 cylinder.
b. Check the harness wire between injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3) when checking No. 2 cylinder.
c. Check the harness wire between injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) when checking No. 3 cylinder.
d. Check the harness wire between injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) when checking No. 4 cylinder.

Q: Is the harness wire in good condition?

YES : Go to Step 11.
NO : Repair it. Then go to Step 12.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 12.
NO : Repair it. Then go to Step 12.

STEP 12. Test the OBD-II drive cycle.

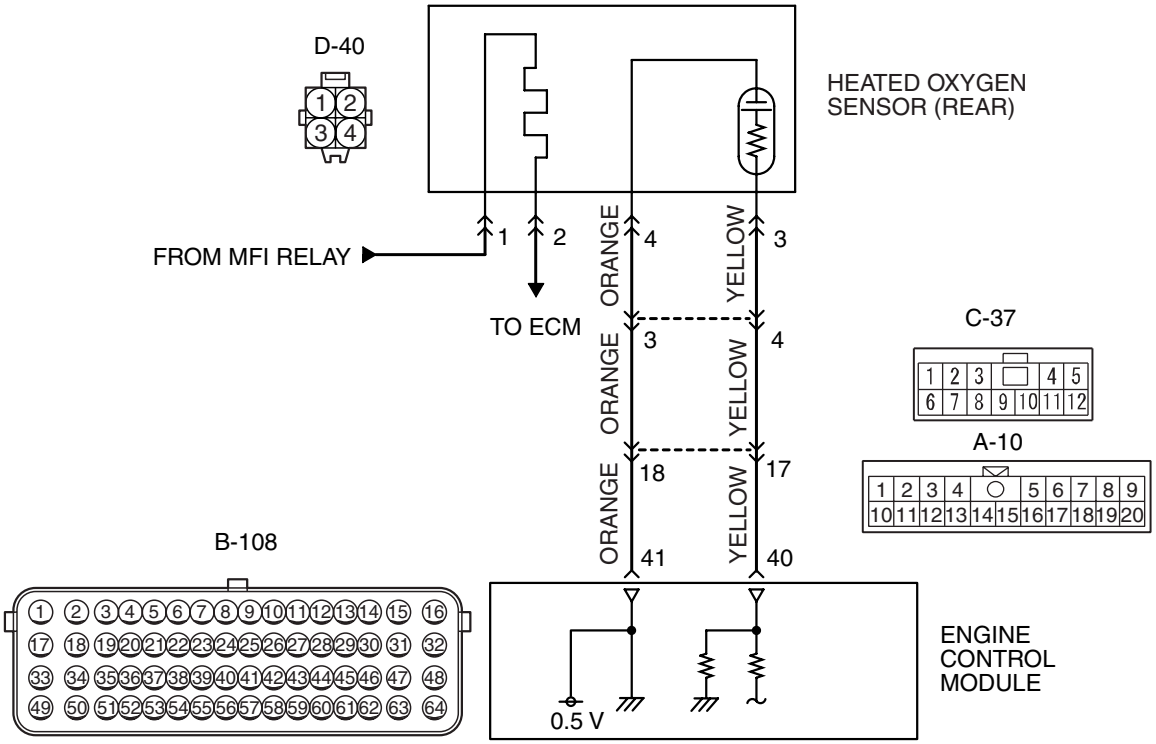
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 12 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0134 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0137: Heated Oxygen Sensor (rear) Circuit Low Voltage <Except for California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <EXCEPT FOR CALIFORNIA>



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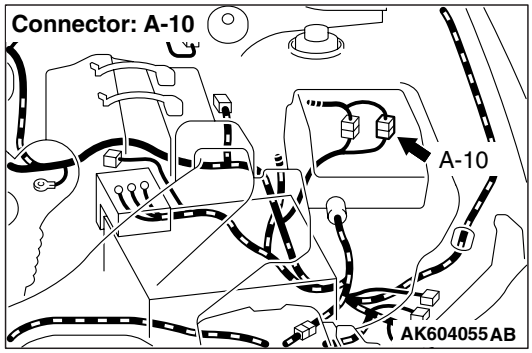
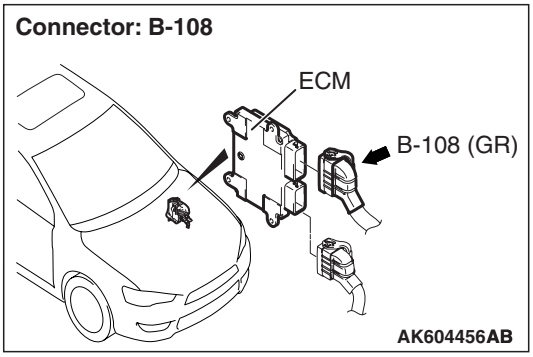
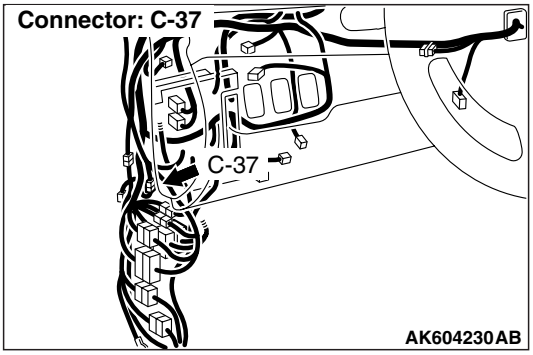
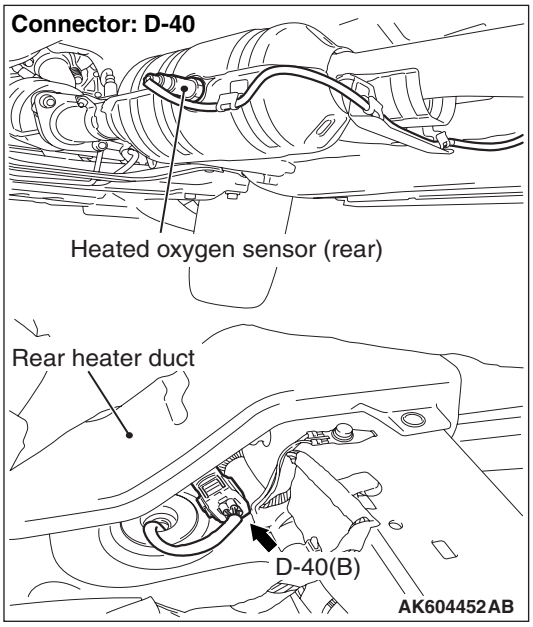






TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

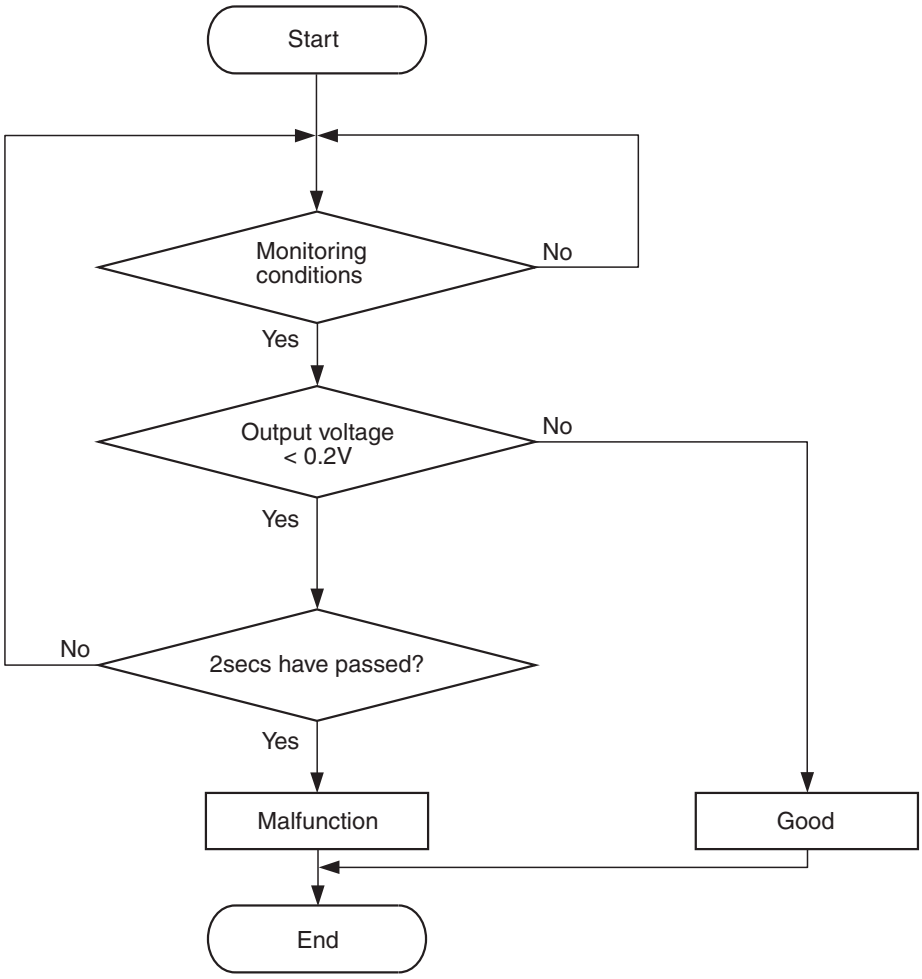
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604321

Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Open or shorted circuit in heated oxygen sensor (rear) output line or harness damage.
- Open circuit in heated oxygen sensor (rear) ground line or harness damage.
- Connector damage.
- ECM failed.

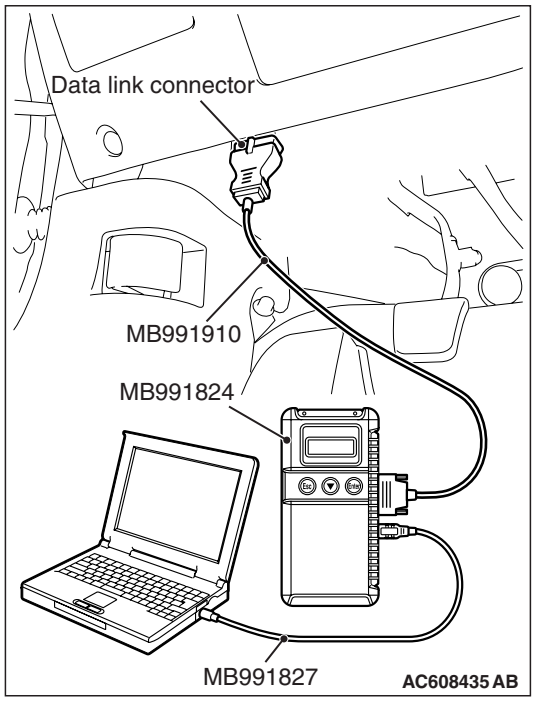
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).



⚠ CAUTION

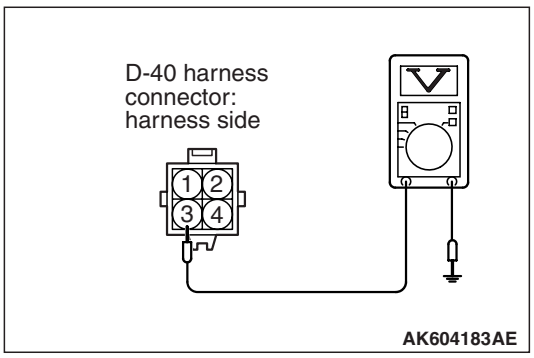
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (rear) connector D-40 by backprobing



(1) Do not disconnect the connector D-40.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 3 and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

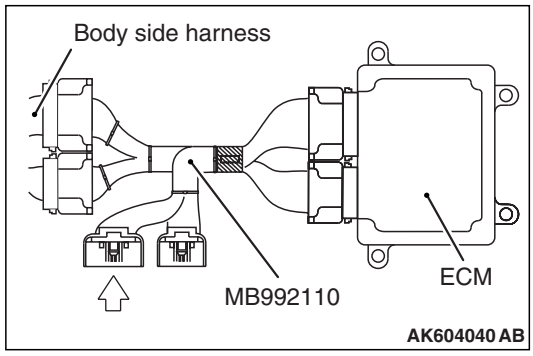
YES : Go to Step 4.

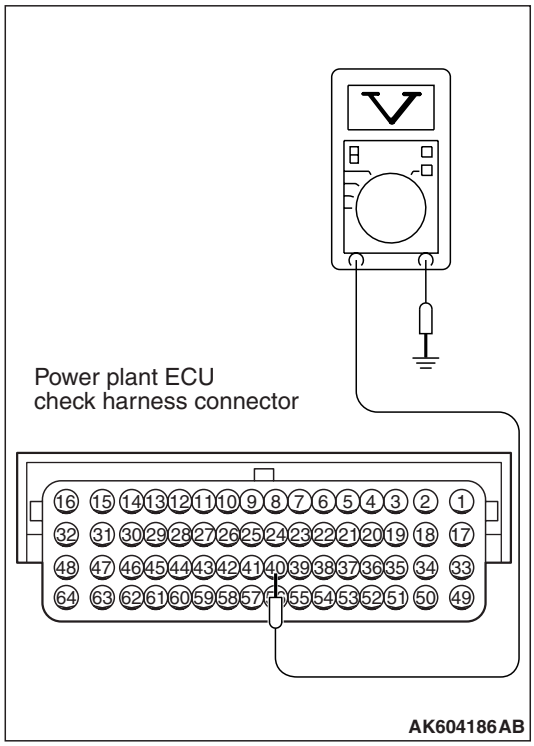
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 40 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (CVT: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

YES : Go to Step 5.

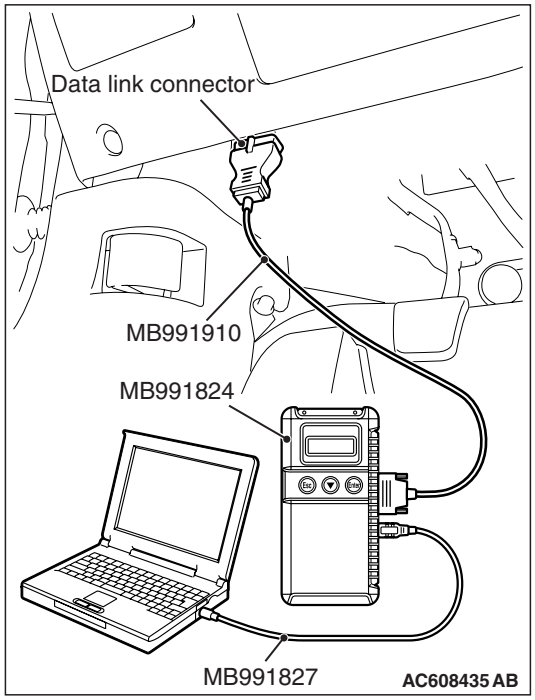
NO : Go to Step 7.

STEP 5. Check harness connector D-40 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

STEP 7. Check harness connector D-40 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 and C-37 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between heated oxygen sensor (rear) connector D-40 (terminal No. 3) and ECM connector B-108 (terminal No. 40) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check harness connector D-40 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

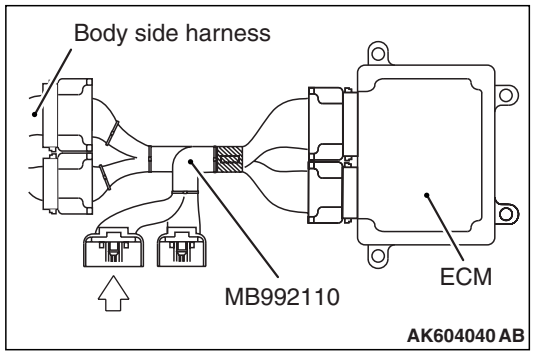
YES : Go to Step 10.

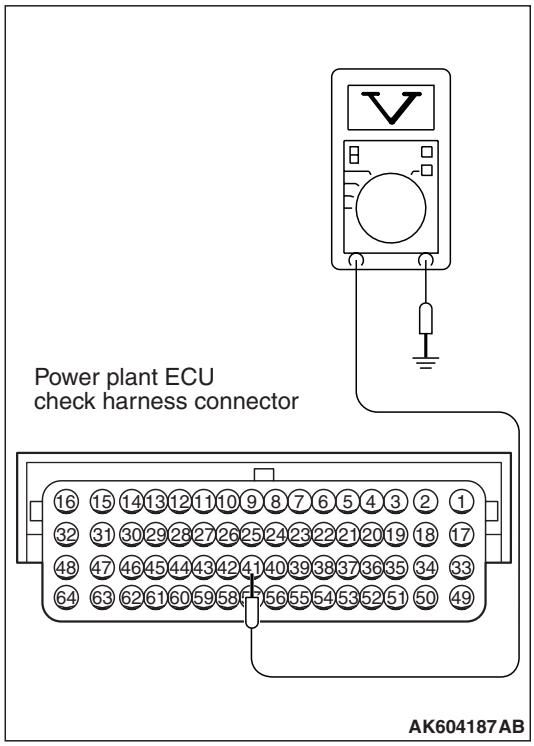
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Measure the sensor offset voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 41 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 11.

NO : Check harness connector A-10 and C-37 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between headed oxygen sensor (rear) connector D-40 (terminal No. 4) and ECM connector B-108 (terminal No. 41) because of open circuit or harness damage. Then go to Step 14.

STEP 11. Check for harness damage between heated oxygen sensor (rear) connector D-40 (terminal No. 4) and ECM connector B-108 (terminal No. 41).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

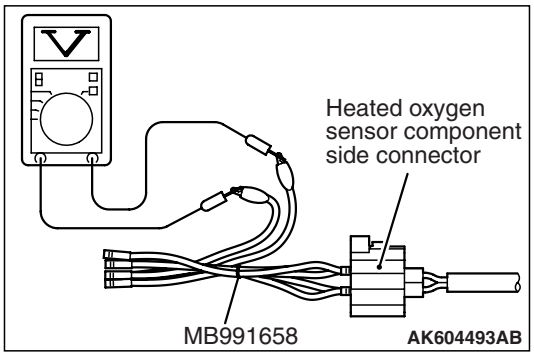
YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for short circuit to ground and harness damage between heated oxygen sensor (rear) connector D-40 (terminal No. 3) and ECM connector B-108 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.



STEP 13. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector D-40 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed (CVT: "L" range)
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 –1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximately 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : Replace the heated oxygen sensor (rear). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

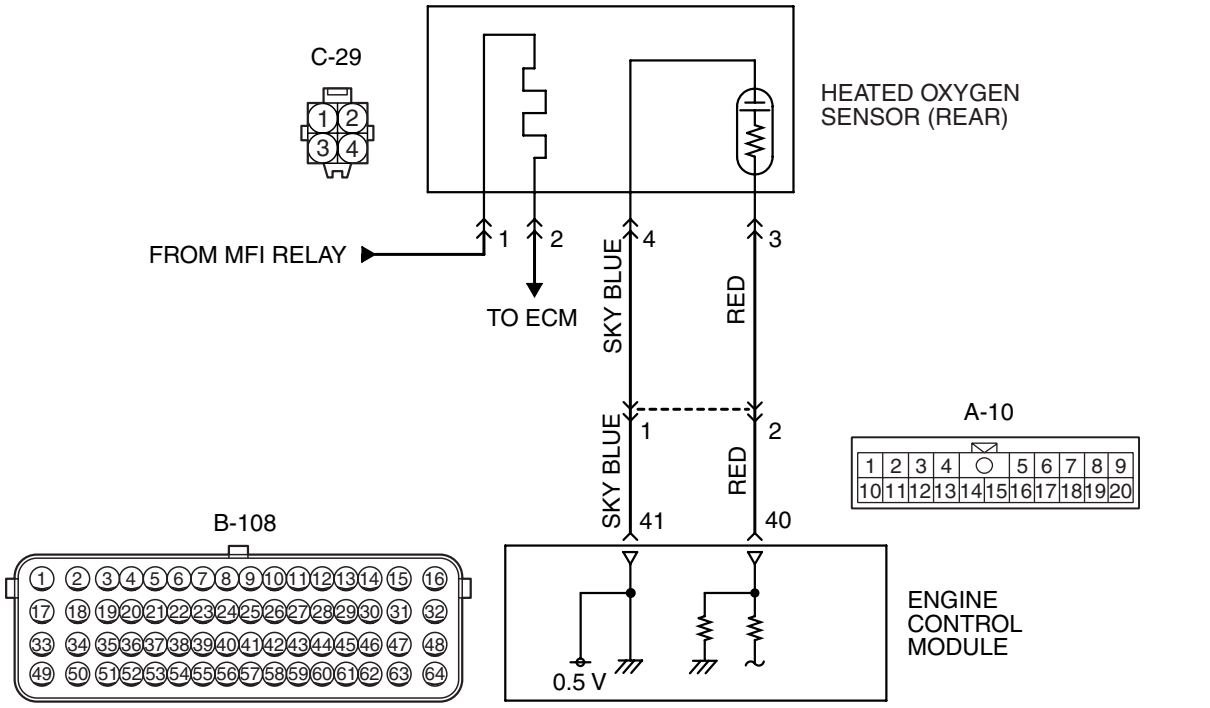
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0137 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0137: Heated Oxygen Sensor (rear) Circuit Low Voltage <California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <CALIFORNIA>



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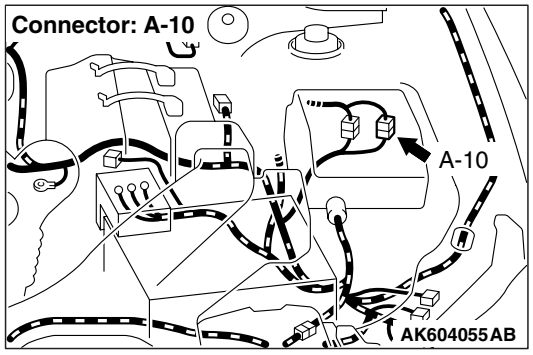
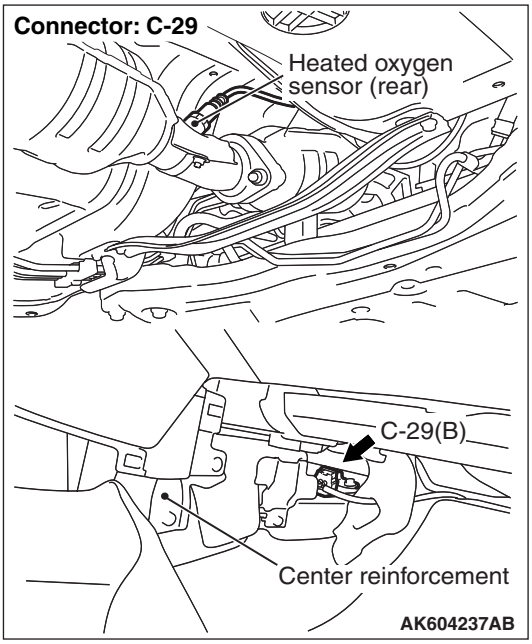
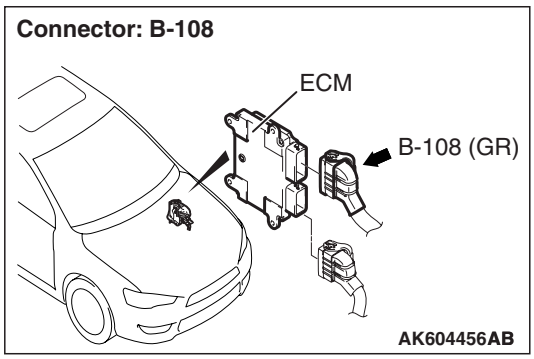






TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

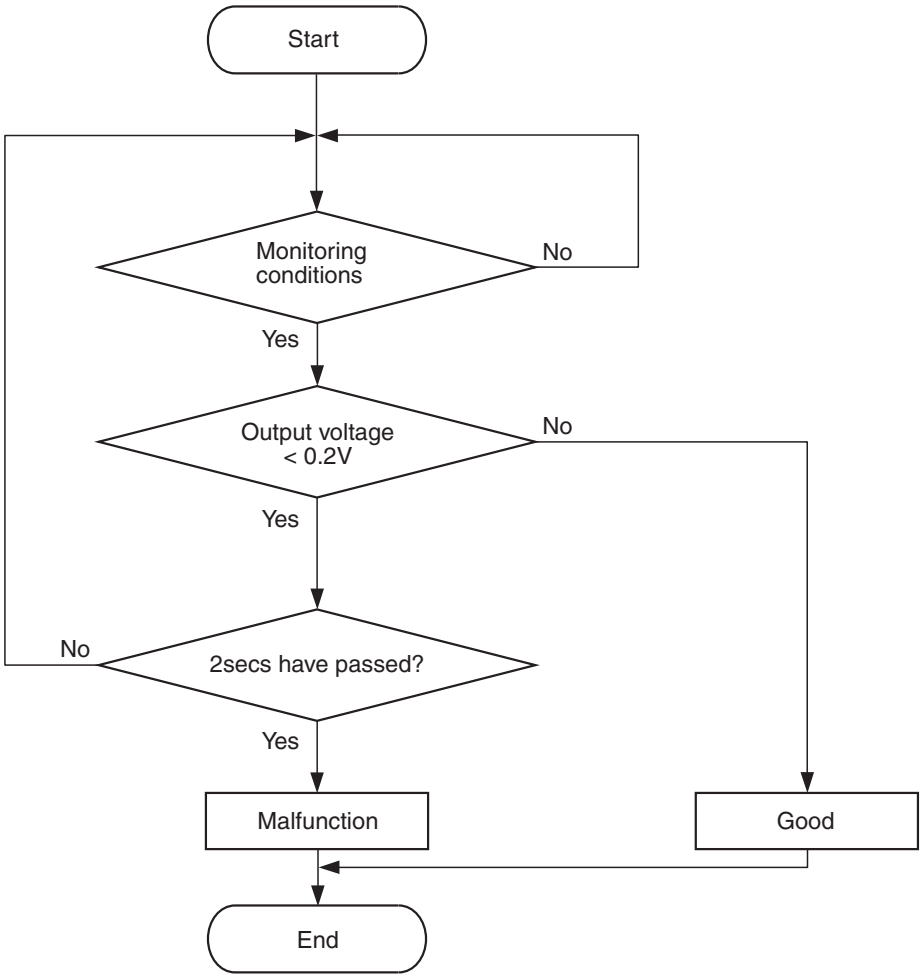
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) failed.
- Open or shorted circuit in heated oxygen sensor (rear) output line or harness damage.
- Open circuit in heated oxygen sensor (rear) ground line or harness damage.
- Connector damage.
- ECM failed.

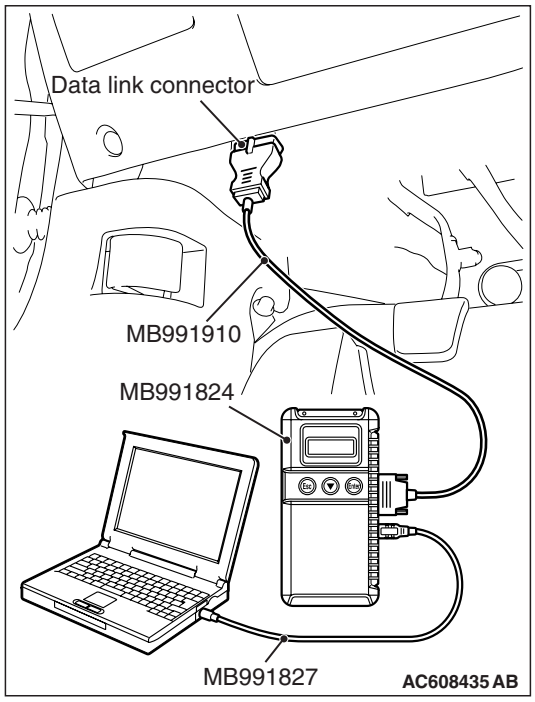
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).



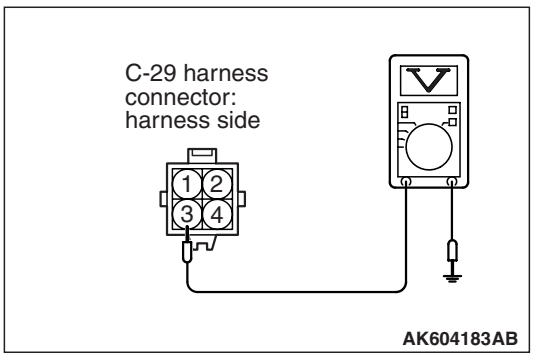
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (rear) connector C-29 by backprobing



(1) Do not disconnect the connector C-29.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 3 and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

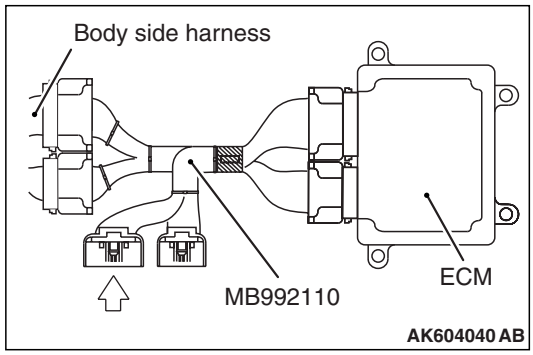
YES : Go to Step 4.

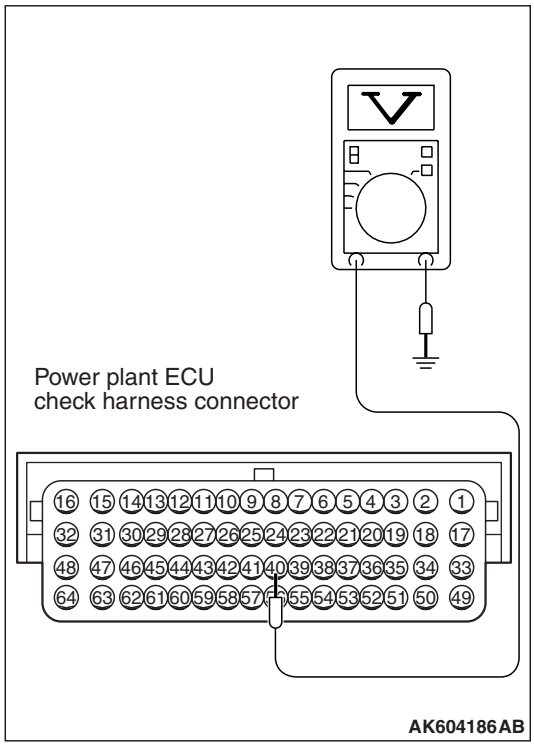
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 40 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (CVT: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

YES : Go to Step 5.

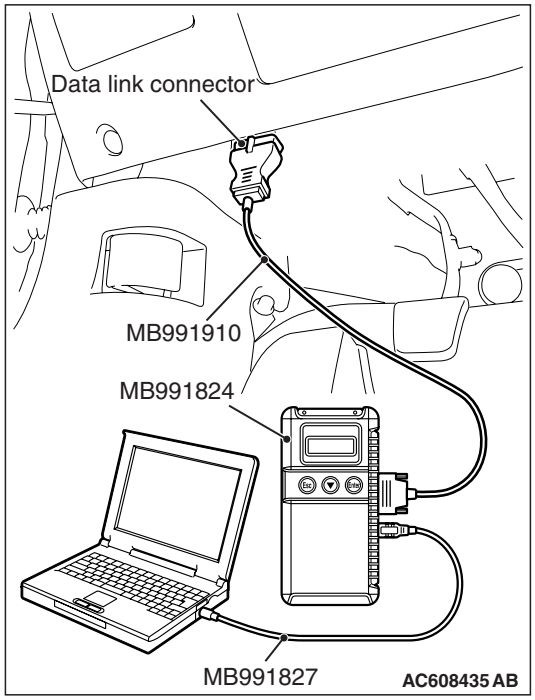
NO : Go to Step 7.

STEP 5. Check harness connector C-29 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

STEP 7. Check harness connector C-29 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between heated oxygen sensor (rear) connector C-29 (terminal No. 3) and ECM connector B-108 (terminal No. 40) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check harness connector C-29 at heated oxygen sensor (rear) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

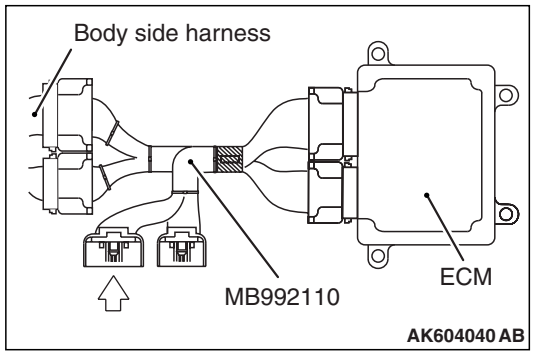
YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Measure the sensor offset voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.



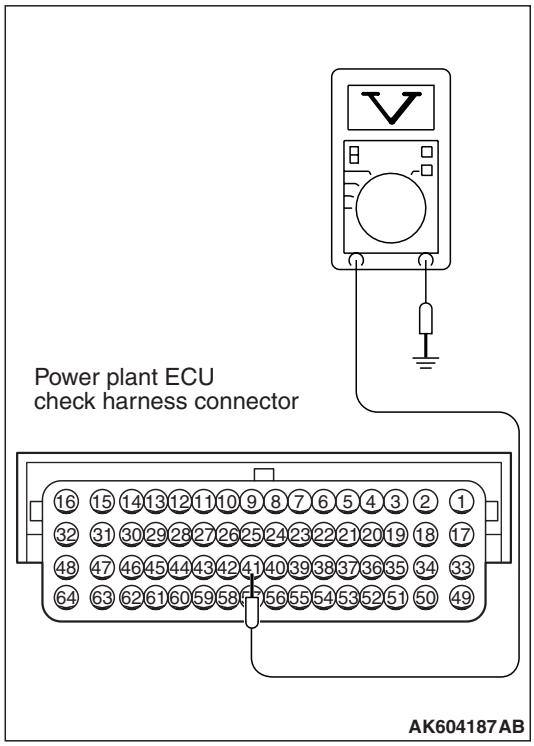
(3) Measure the voltage between terminal No. 41 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 11.

NO : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between heated oxygen sensor (rear) connector C-29 (terminal No. 4) and ECM connector B-108 (terminal No. 41) because of open circuit or harness damage. Then go to Step 14.



STEP 11. Check for harness damage between heated oxygen sensor (rear) connector C-29 (terminal No. 4) and ECM connector B-108 (terminal No. 41).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

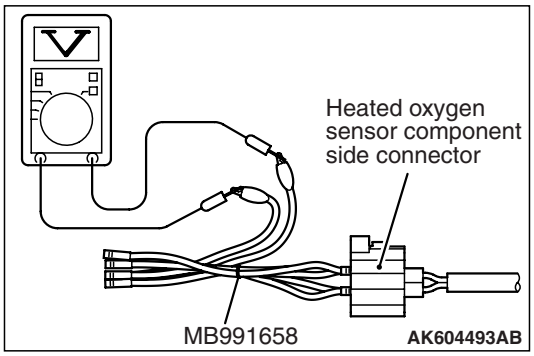
YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for short circuit to ground and harness damage between heated oxygen sensor (rear) connector C-29 (terminal No. 3) and ECM connector B-108 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.



STEP 13. Check the heated oxygen sensor (rear).

(1) Disconnect the heated oxygen sensor (rear) connector C-29 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (rear) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed (CVT: "L" range)
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 –1.0 V

⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximately 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : Replace the heated oxygen sensor (rear). Then go to Step 14.

STEP 14. Test the OBD-II drive cycle.

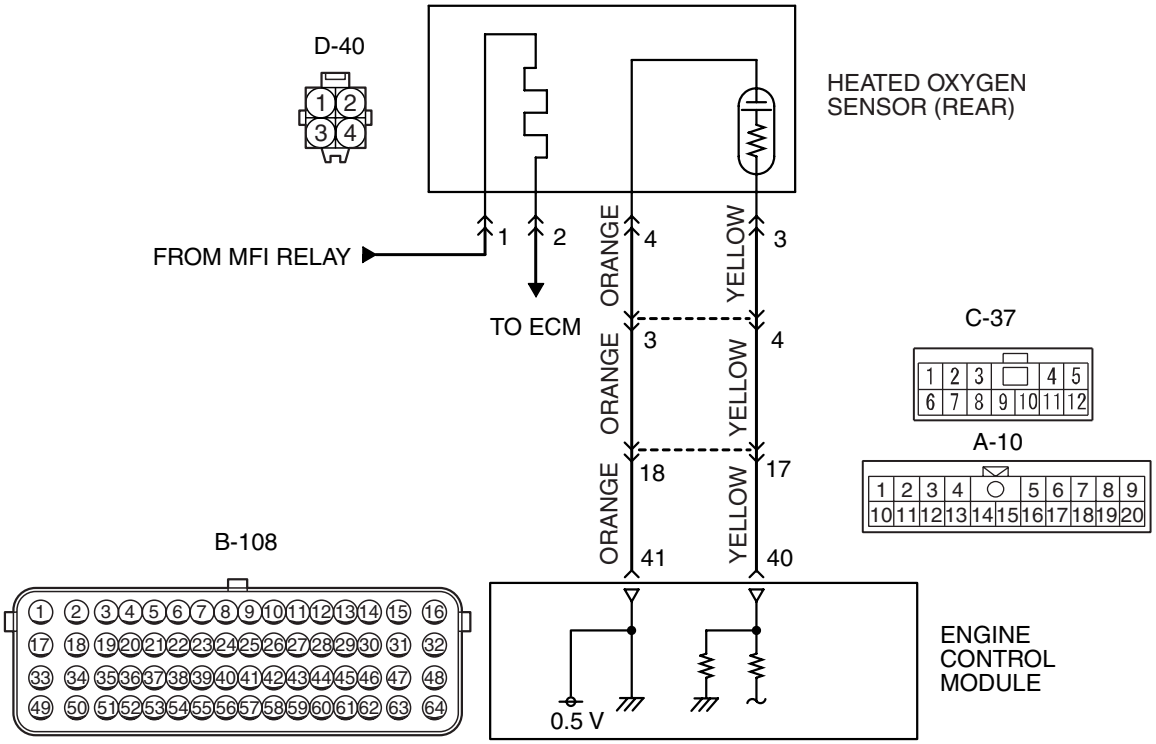
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0137 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0138: Heated Oxygen Sensor (rear) Circuit High Voltage <Except for California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <EXCEPT FOR CALIFORNIA>



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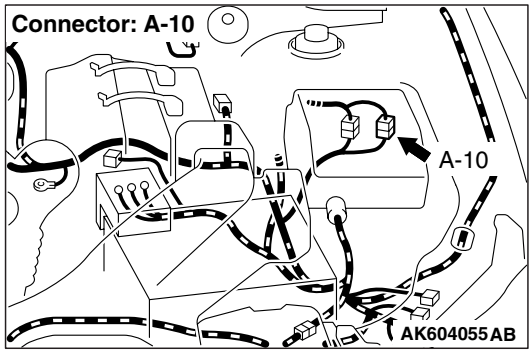
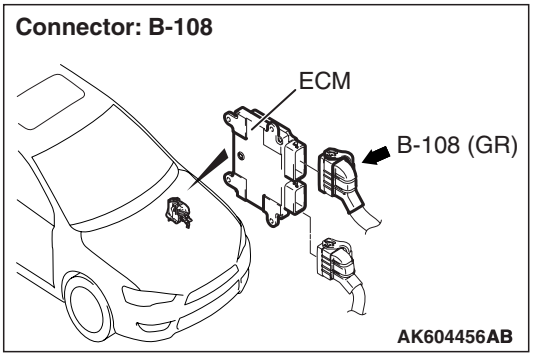
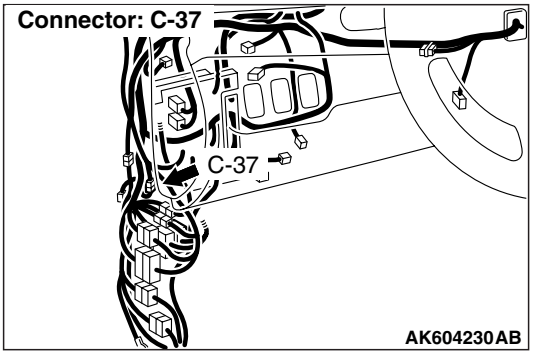
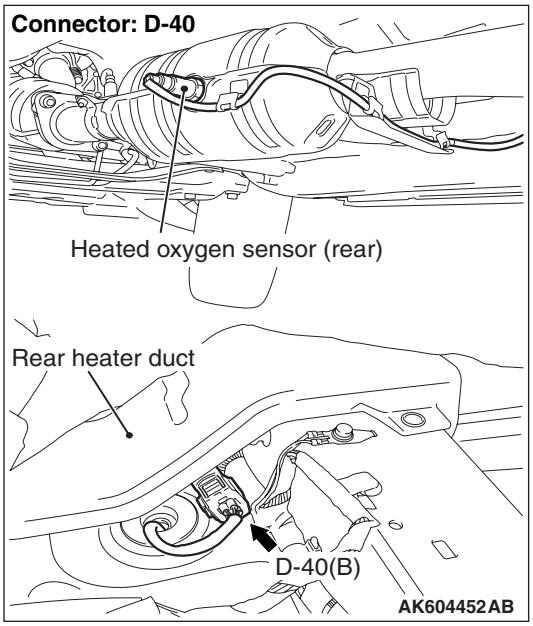






TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

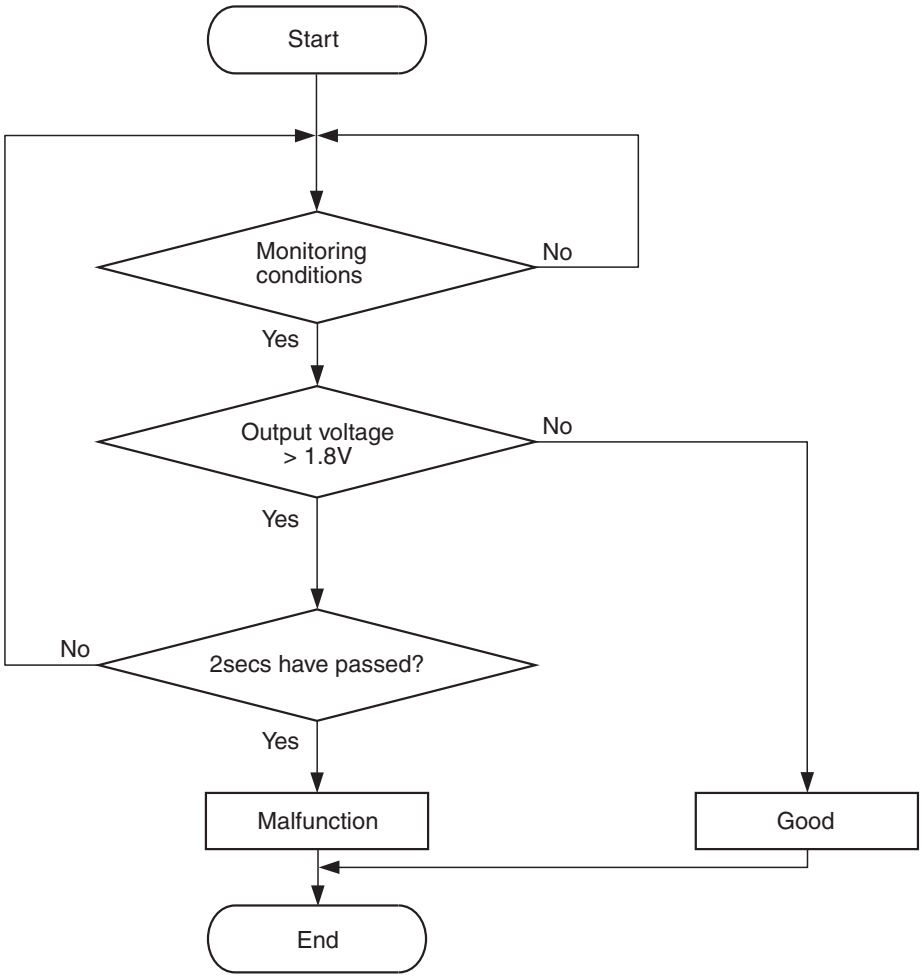
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in heated oxygen sensor (rear) output line.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check harness connector D-40 at heated oxygen sensor (rear) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 2. Check for short circuit to power supply between heated oxygen sensor (rear) connector D-40 (terminal No. 3) and ECM connector B-108 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

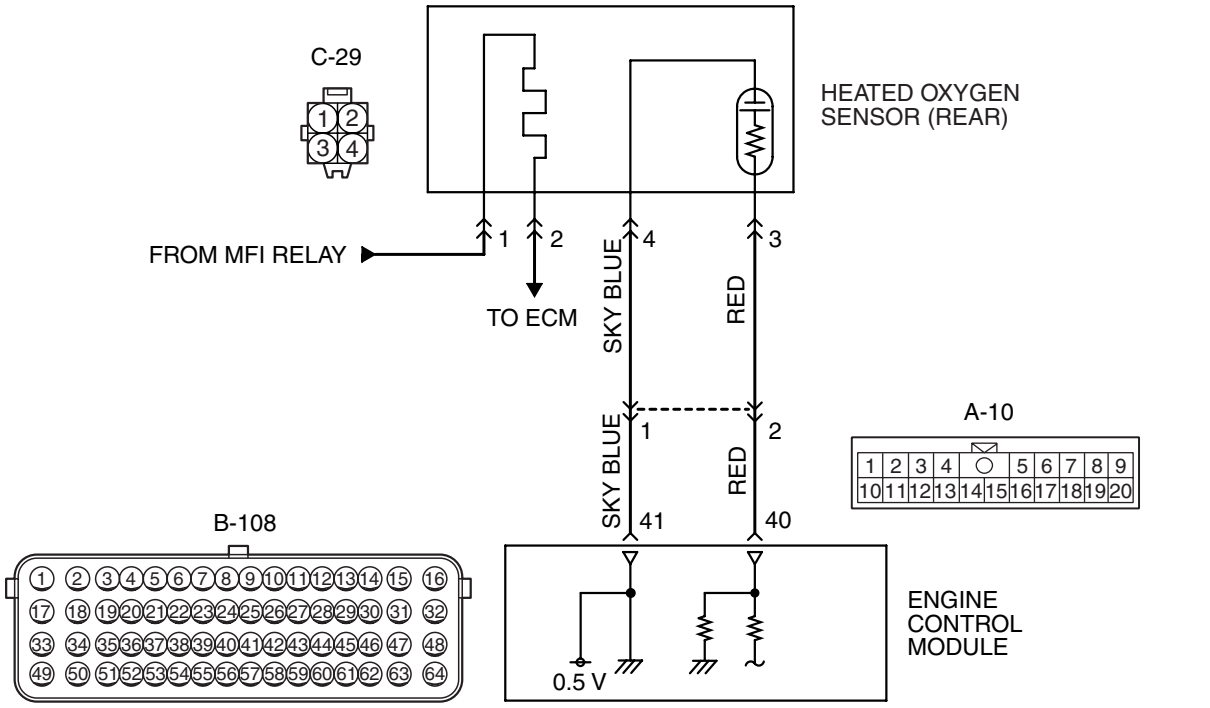
Q: Is DTC P0138 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0138: Heated Oxygen Sensor (rear) Circuit High Voltage <California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <CALIFORNIA>



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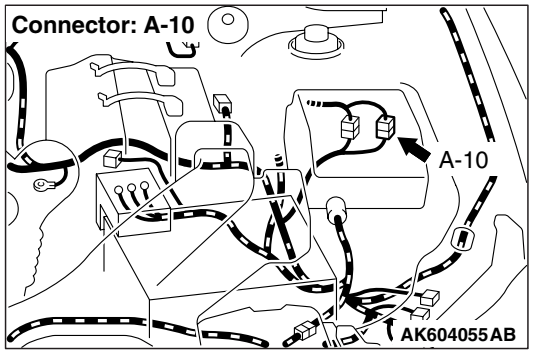
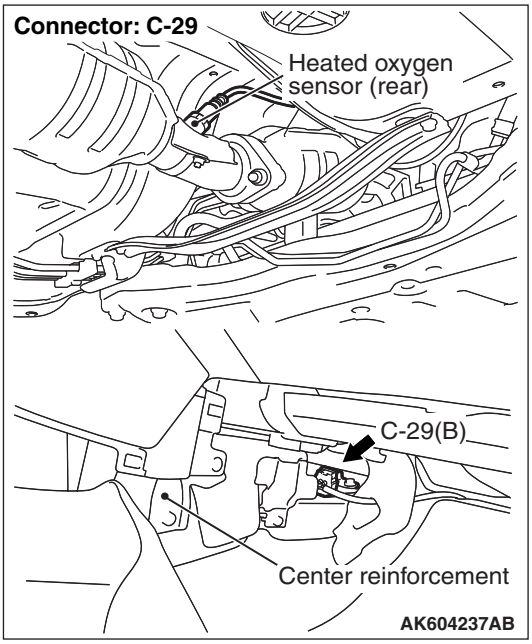
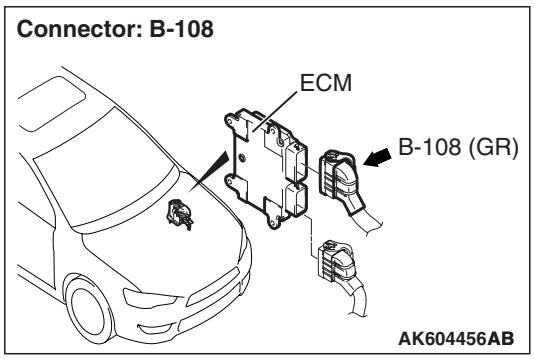






TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

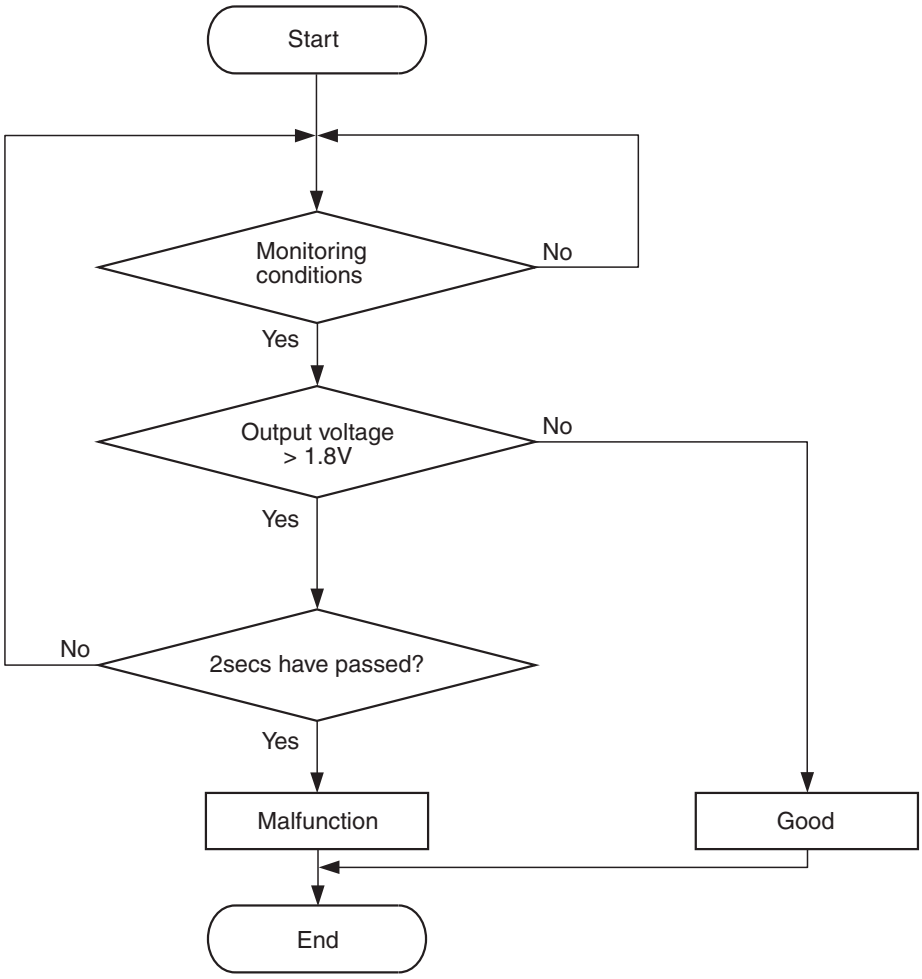
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in heated oxygen sensor (rear) output line.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check harness connector C-29 at heated oxygen sensor (rear) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 2. Check for short circuit to power supply between heated oxygen sensor (rear) connector C-29 (terminal No. 3) and ECM connector B-108 (terminal No. 40).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

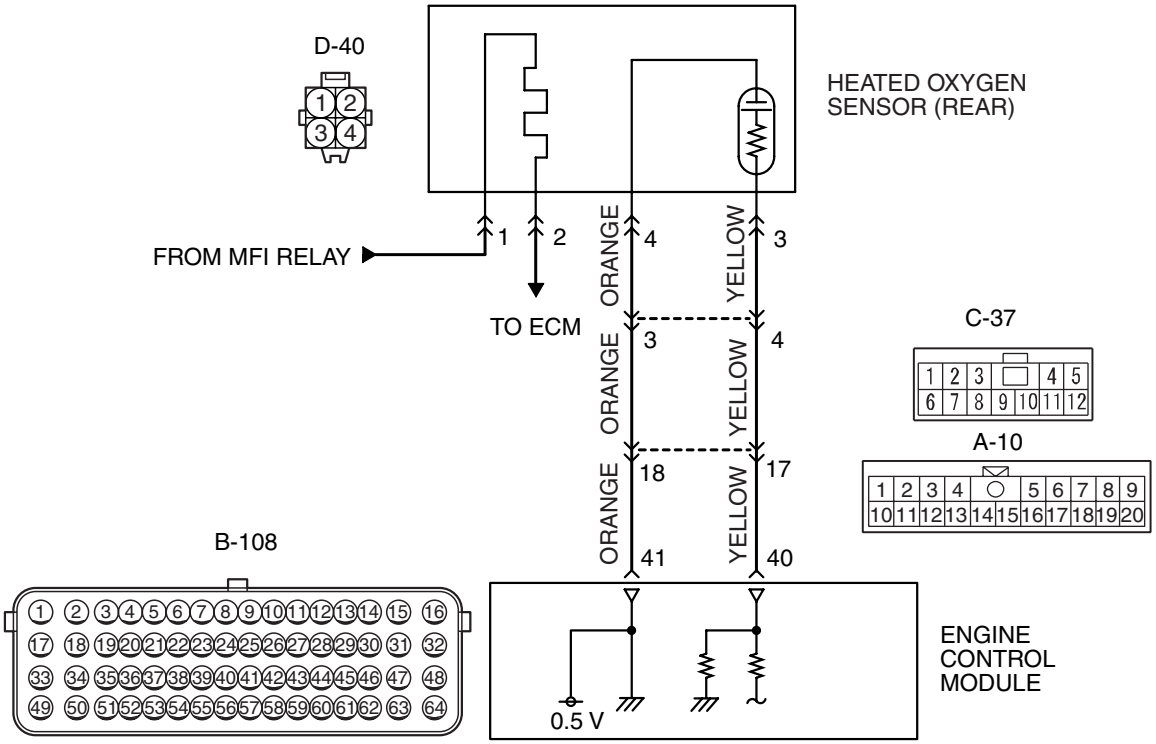
Q: Is DTC P0138 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0139: Heated Oxygen Sensor (rear) Circuit Slow Responce <Except for California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <EXCEPT FOR CALIFORNIA>



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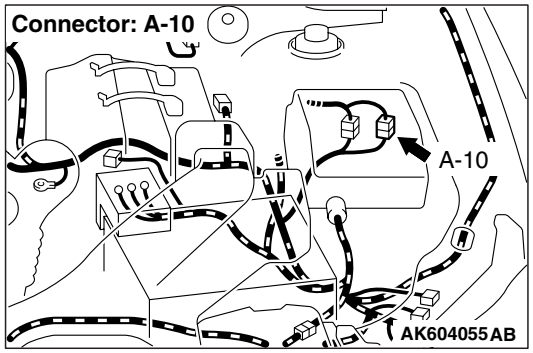
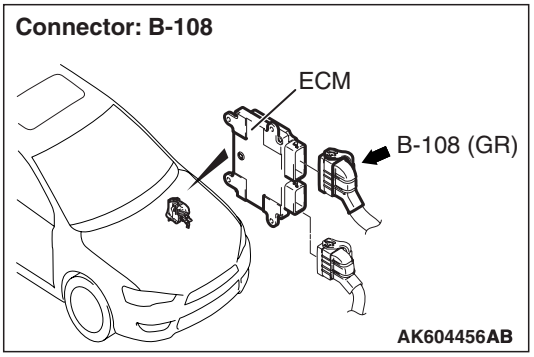
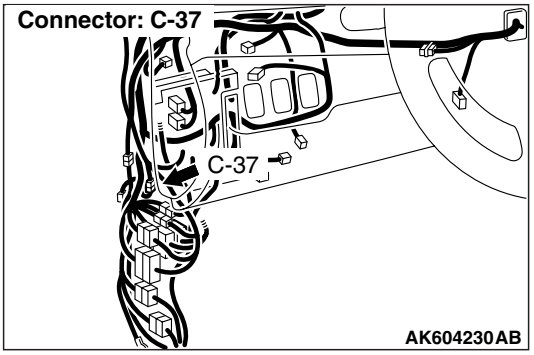
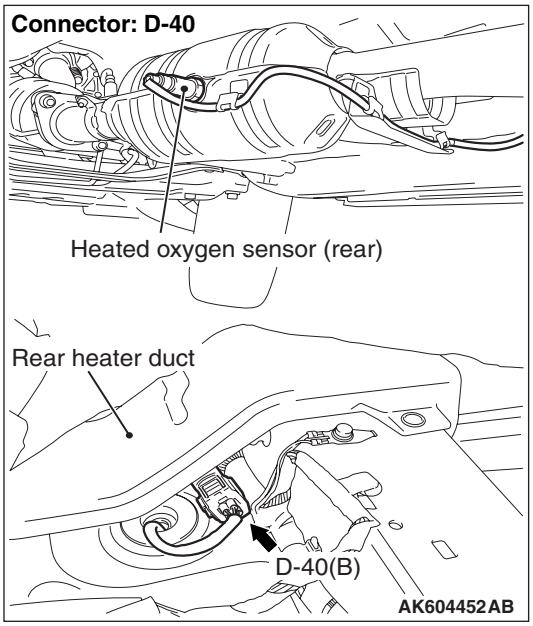






TSB Revision



CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear)

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

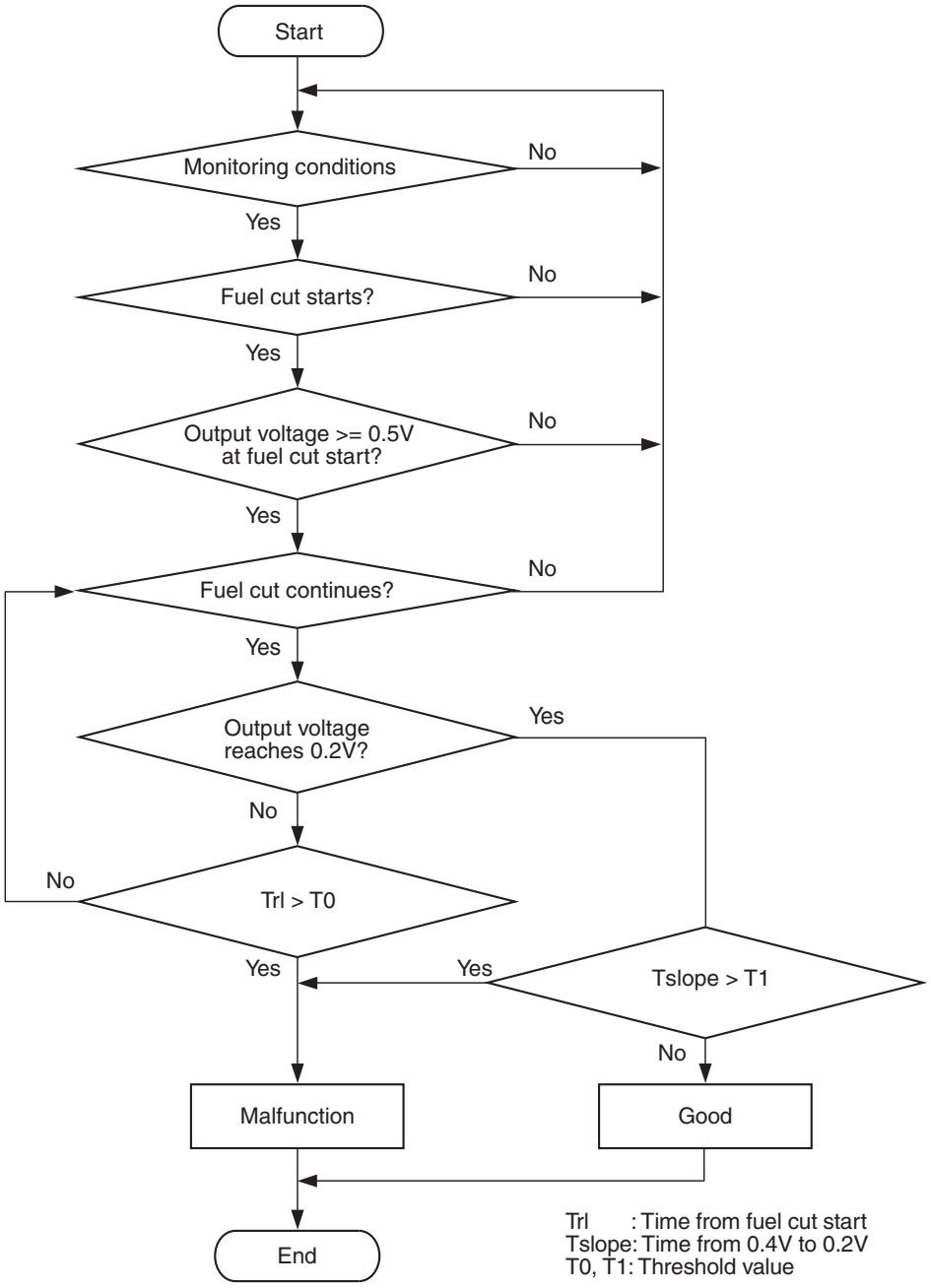
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.
- Heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

or

- Heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 1 second from 0.4 volt while fuel is being shut off.

NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13A-10.

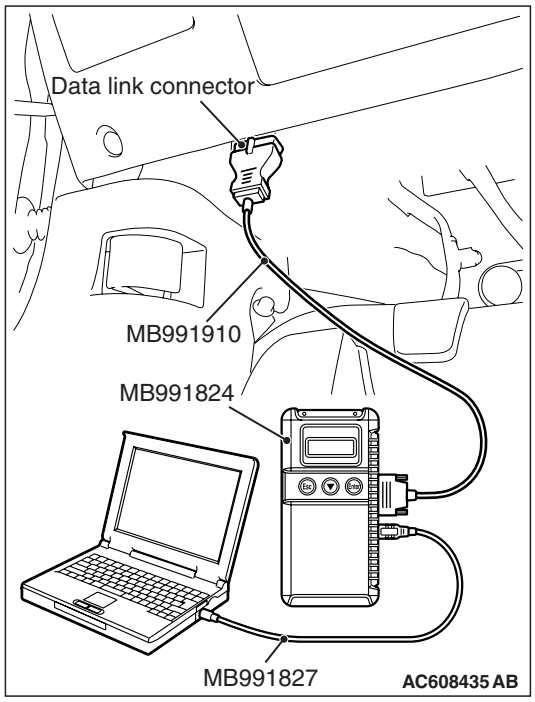
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

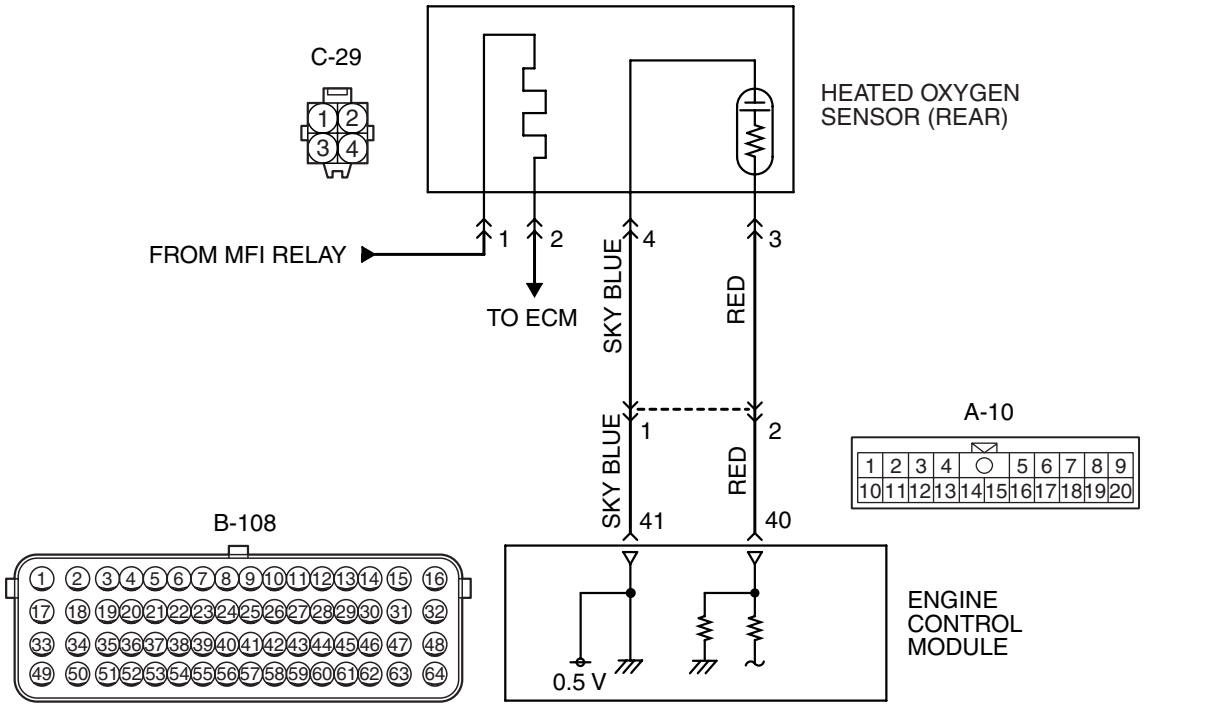
Q: Is DTC P0139 set?

YES : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <Except for California> P.13A-274, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <Except for California> P.13A-292.

NO : The inspection is complete.

DTC P0139: Heated Oxygen Sensor (rear) Circuit Slow Responce <California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <CALIFORNIA>



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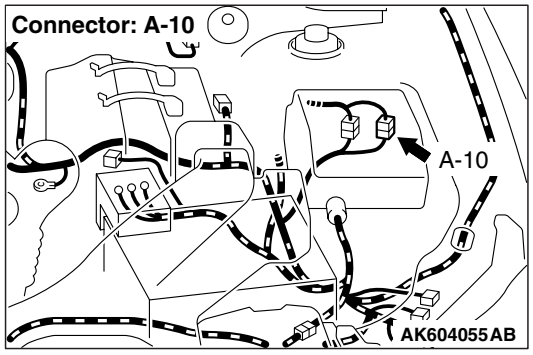
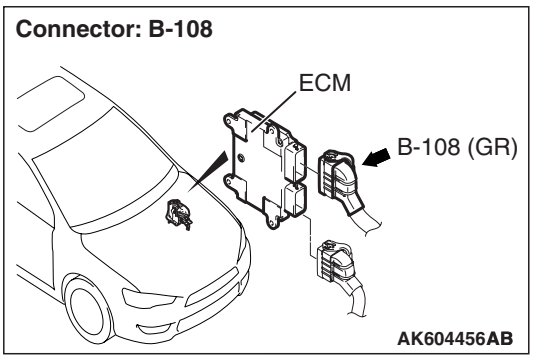
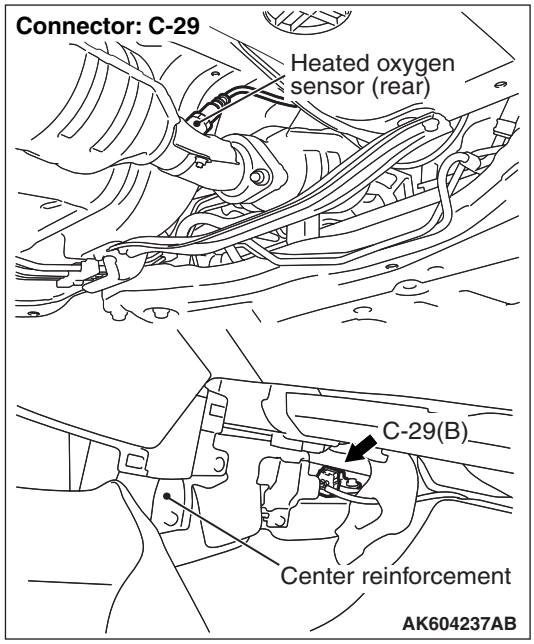






TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear)

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

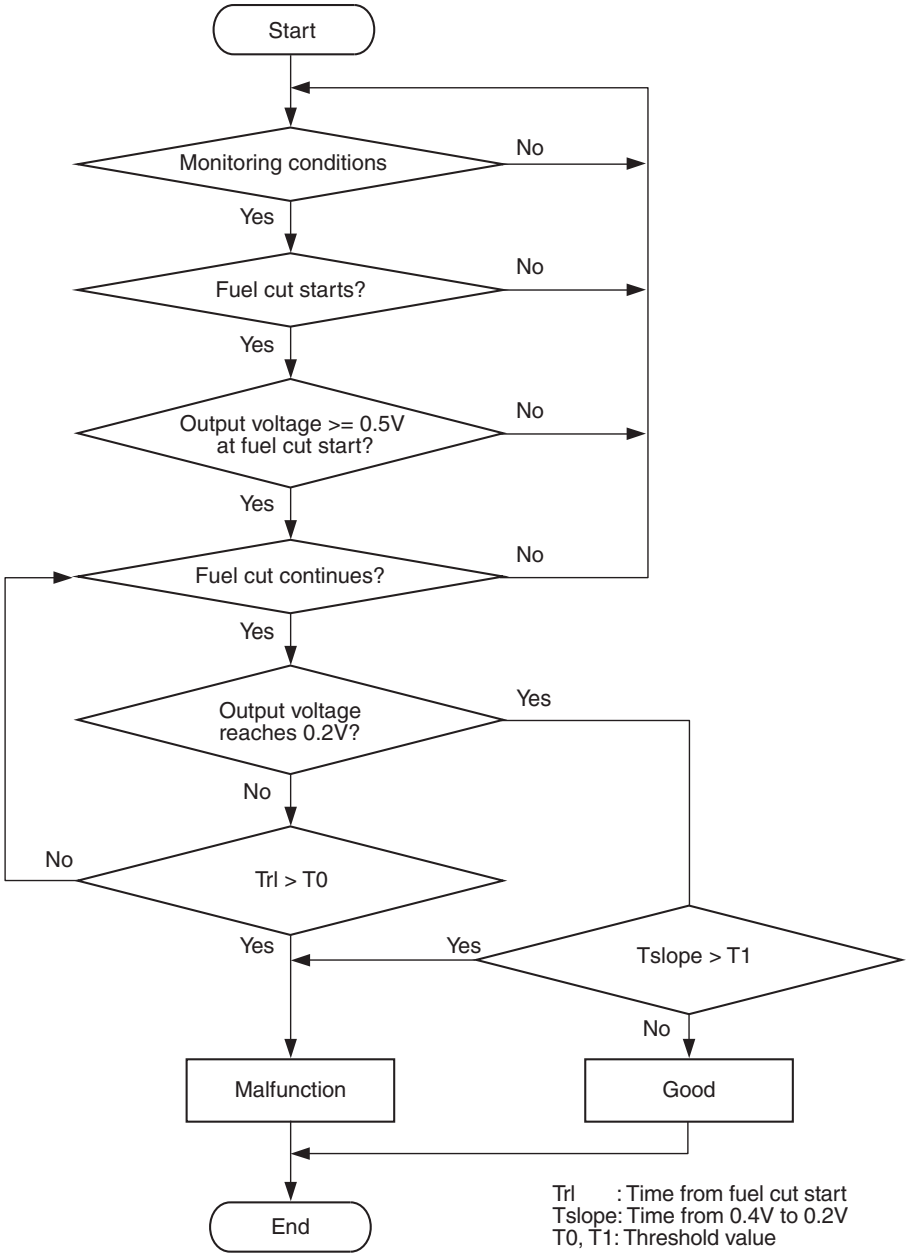
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Fuel is being shut off.
- Heated oxygen sensor (rear) output voltage is higher than 0.5 volt when fuel cut is started.

Judgement Criterion

- Heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 6 seconds from fuel cut start.

or

- Heated oxygen sensor (rear) output voltage does not reach 0.2 volt for 1 second from 0.4 volt while fuel is being shut off.

NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

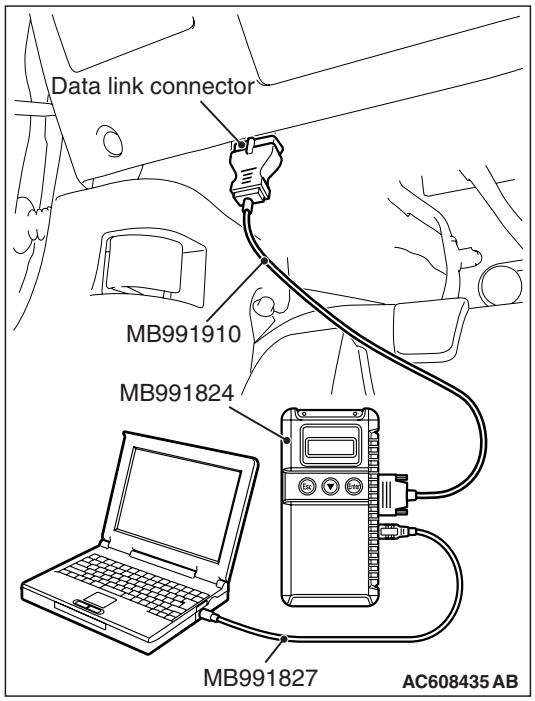
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 6 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.



STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

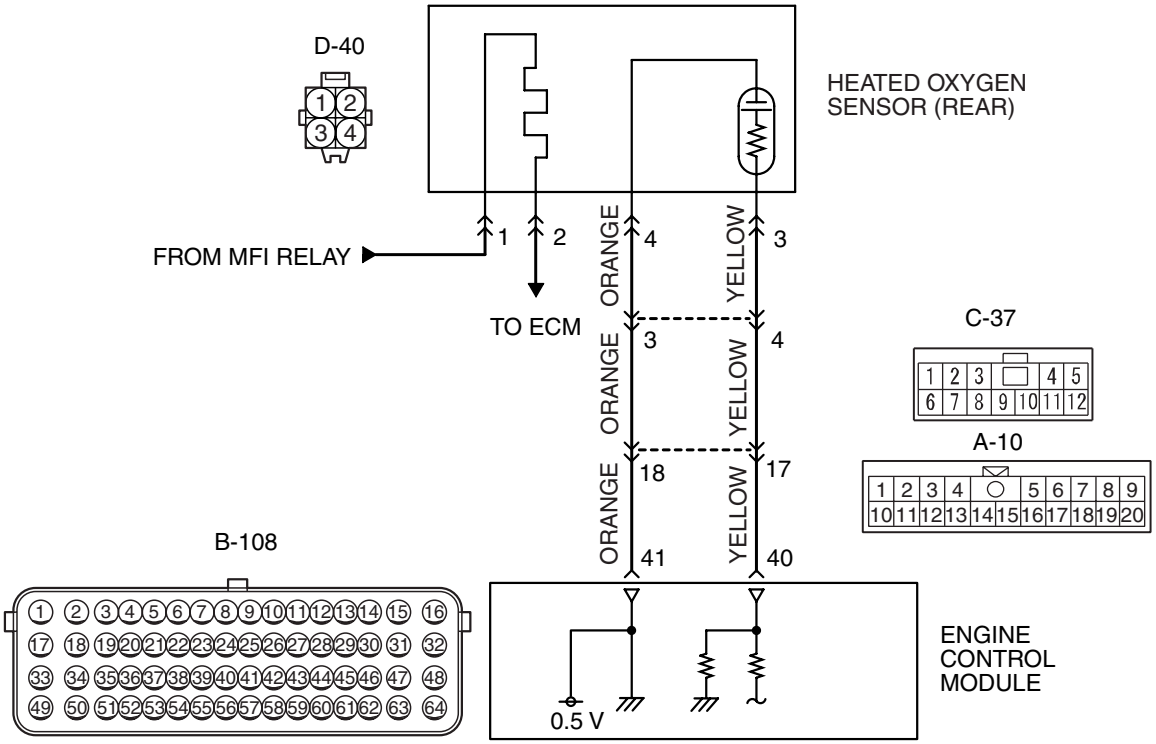
Q: Is DTC P0139 set?

YES : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <California> P.13A-283, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <California> P.13A-296.

NO : The inspection is complete.

DTC P0140: Heated Oxygen Sensor (rear) Circuit No Activity Detected <Except for California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <EXCEPT FOR CALIFORNIA>



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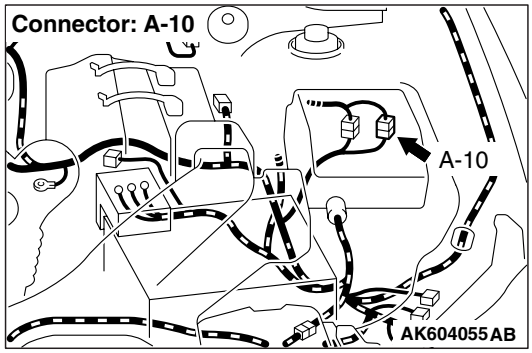

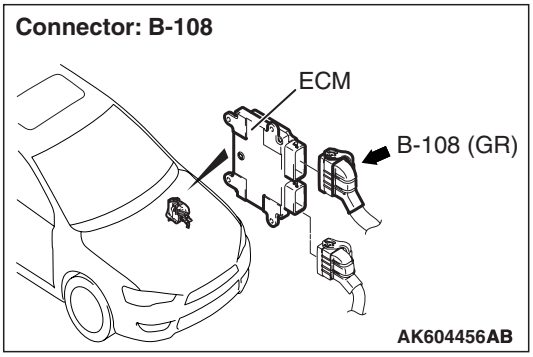

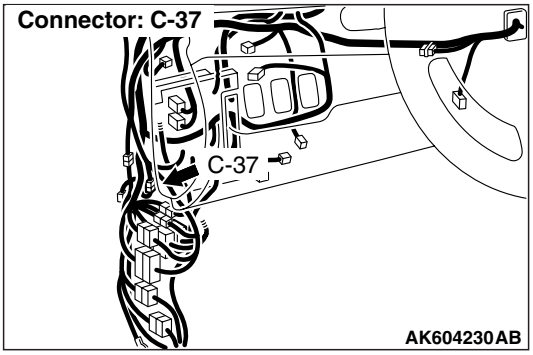

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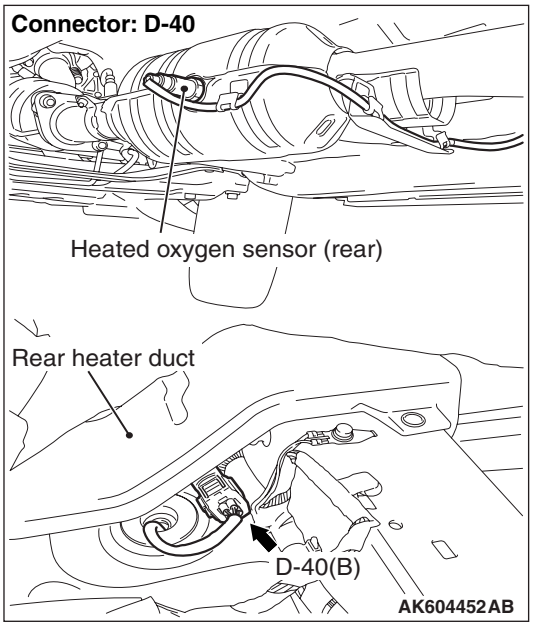


CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

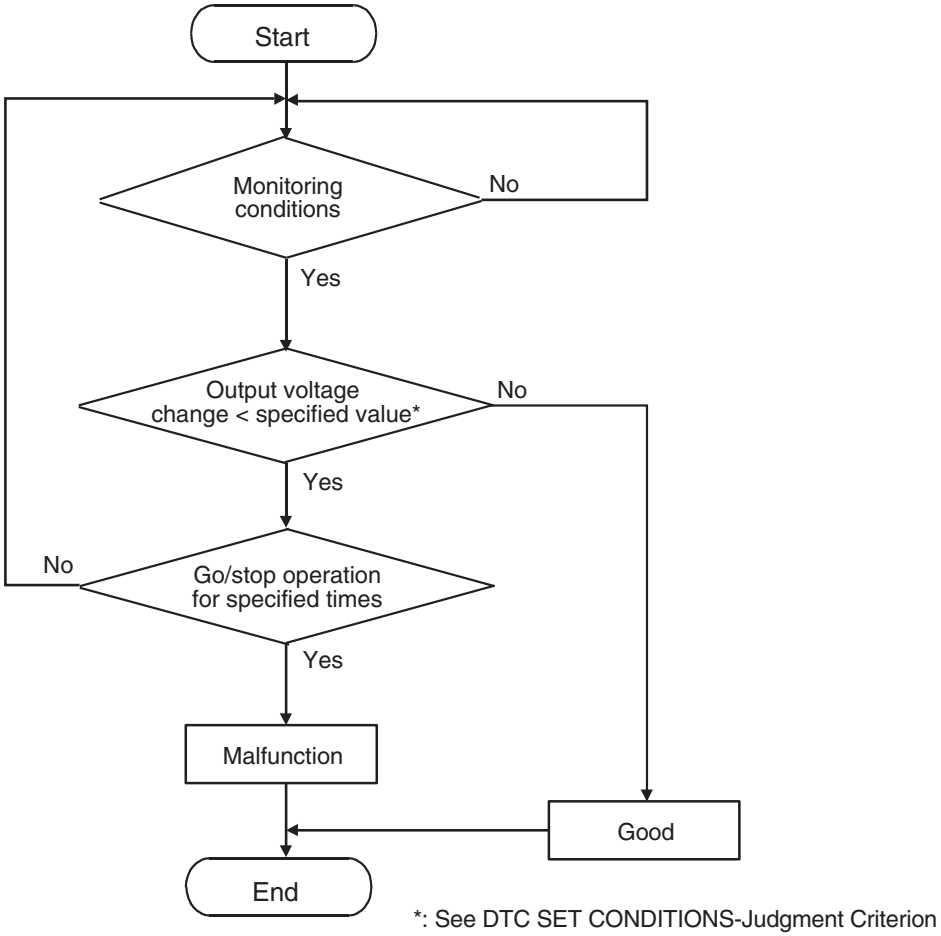
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the heated oxygen sensor (rear) is lower than 0.313 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

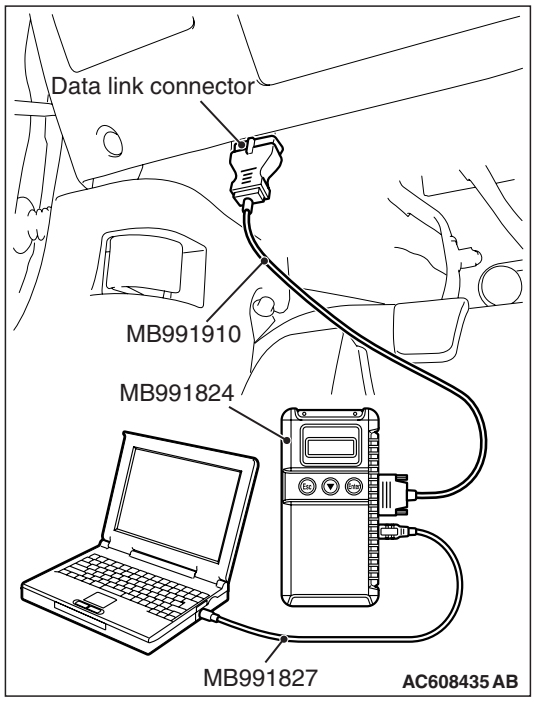
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

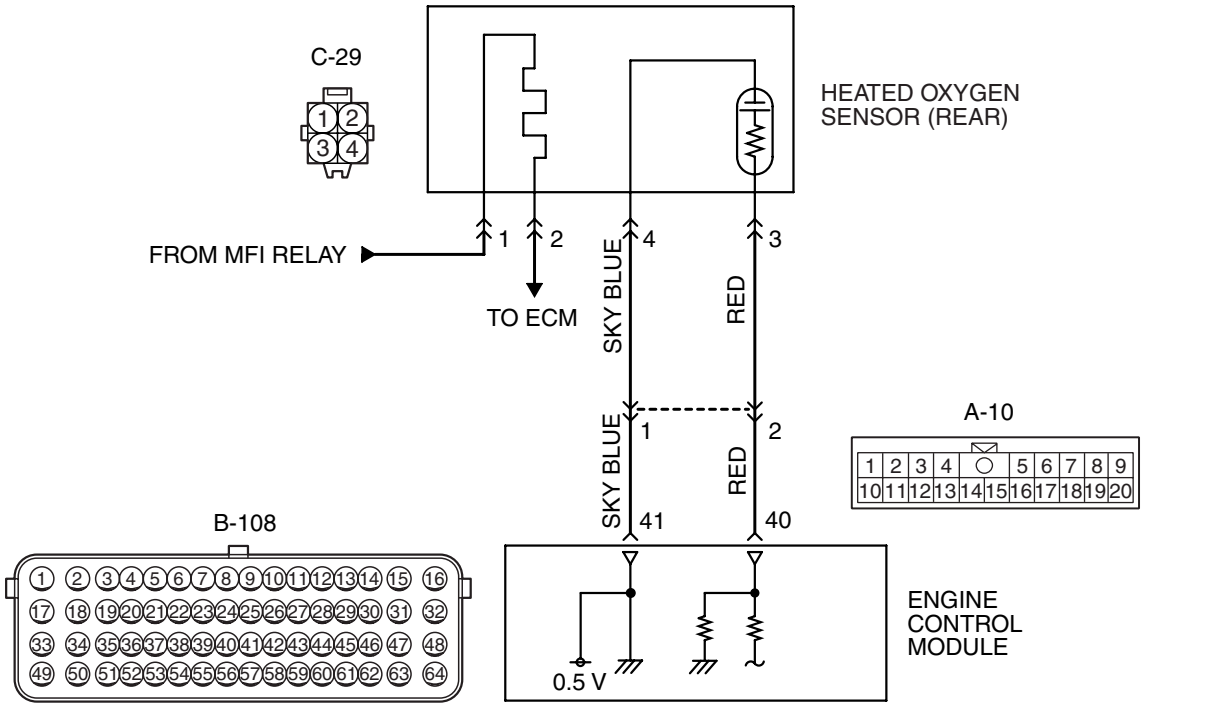
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0140 set?

YES : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <Except for California> P.13A-274, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <Except for California> P.13A-292.
NO : The inspection is complete.

DTC P0140: Heated Oxygen Sensor (rear) Circuit No Activity Detected <California>

HEATED OXYGEN SENSOR (REAR) CIRCUIT <CALIFORNIA>



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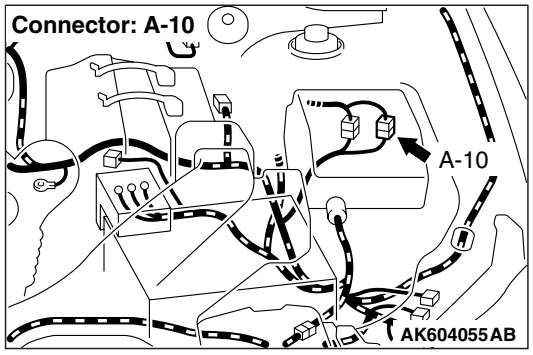
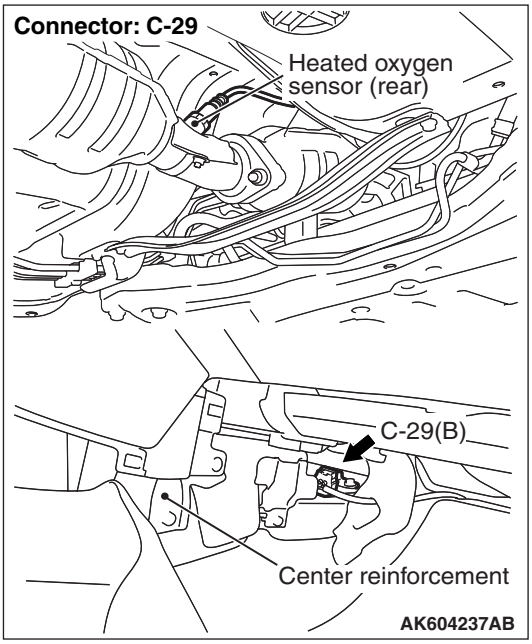
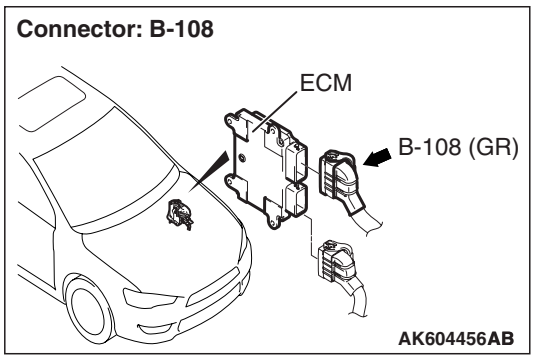






TSB Revision

CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 40) from the output terminal (terminal No. 3) of the heated oxygen sensor (rear).
- Terminal No. 4 of the heated oxygen sensor (rear) is grounded with ECM (terminal No. 41).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (rear).

TECHNICAL DESCRIPTION

- The output signal of the heated oxygen sensor (front) is compensated by the output signal of the heated oxygen sensor (rear).
- The ECM checks for the heated oxygen sensor (rear) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (rear) output voltage does not change during specified go/stop operations including fuel cut are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

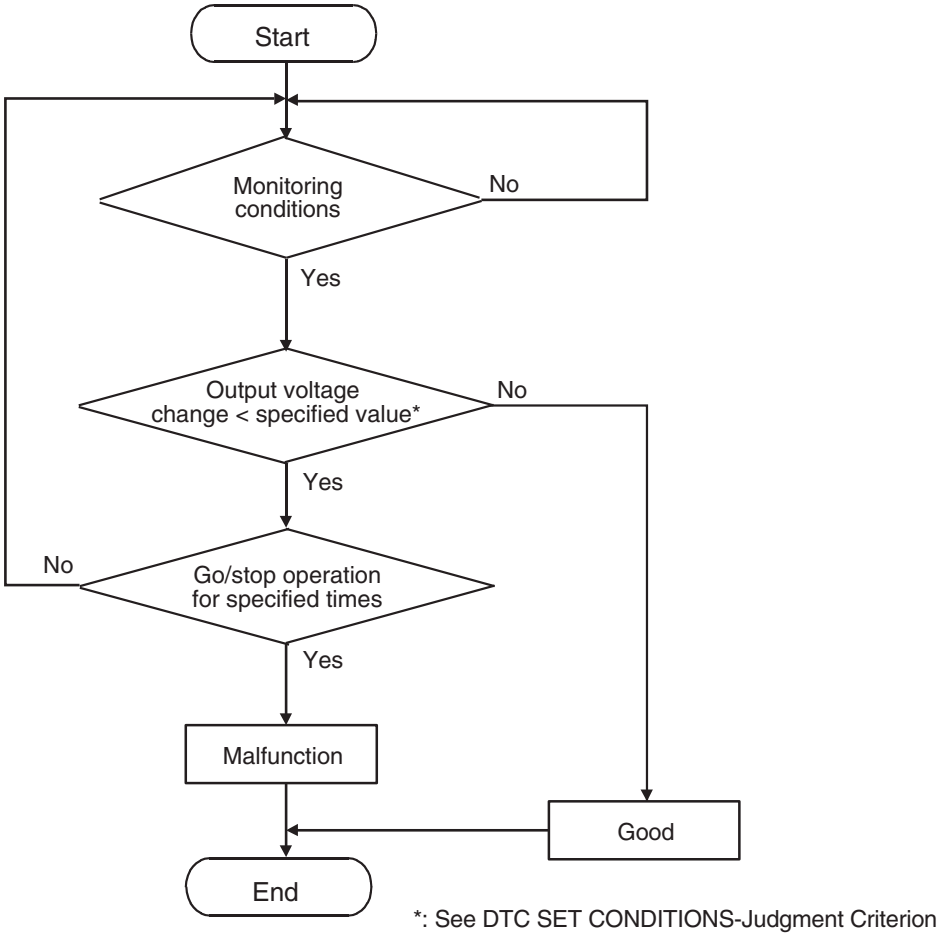
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 1,638 g.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the heated oxygen sensor (rear) is lower than 0.313 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13A-10.

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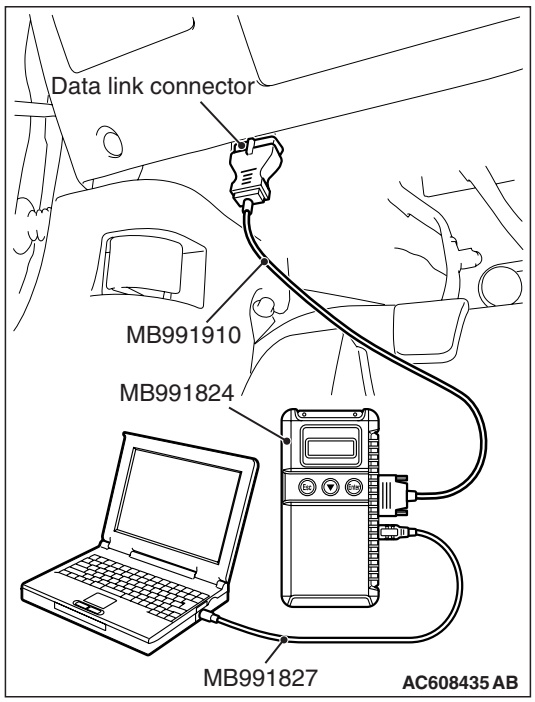
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (rear) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item AD: Heated Oxygen Sensor (rear).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the heated oxygen sensor (rear). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

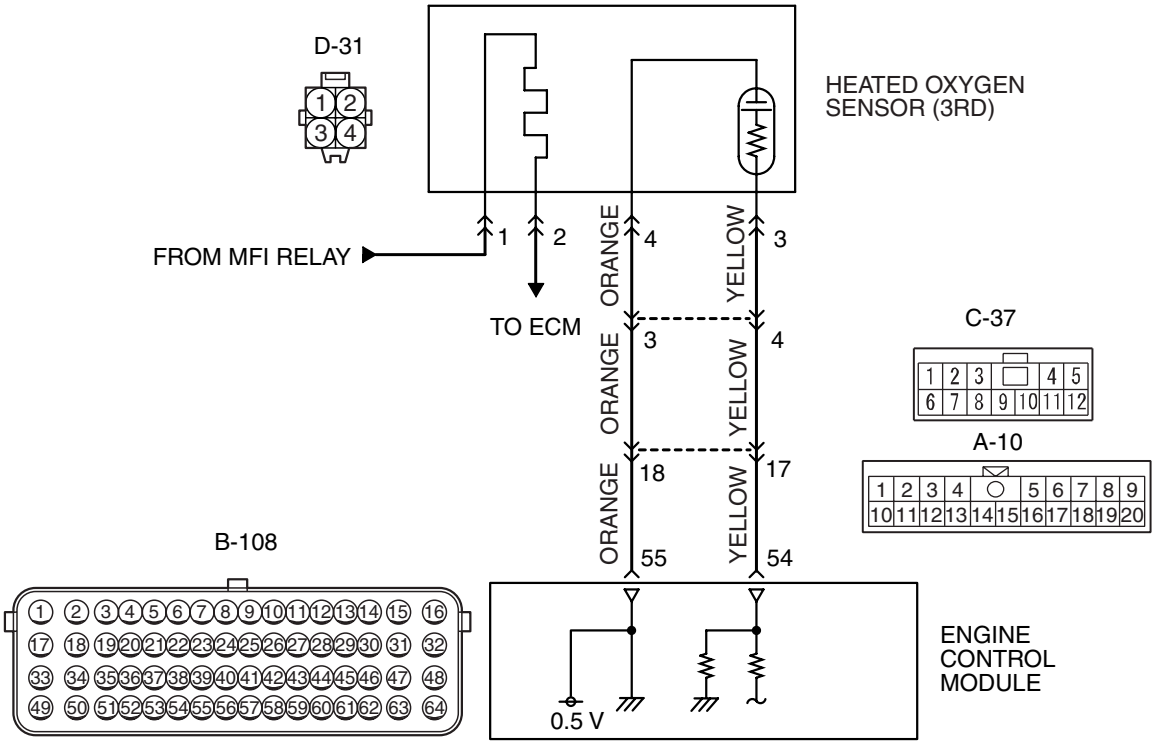
Q: Is DTC P0140 set?

YES : Refer to DTC P0137 –Heated Oxygen Sensor (rear) Circuit Low Voltage <California> P.13A-283, DTC P0138 –Heated Oxygen Sensor (rear) Circuit High Voltage <California> P.13A-296.

NO : The inspection is complete.

DTC P0143: Heated Oxygen Sensor (3rd) Circuit Low Voltage <California>

HEATED OXYGEN SENSOR (3RD) CIRCUIT <CALIFORNIA>



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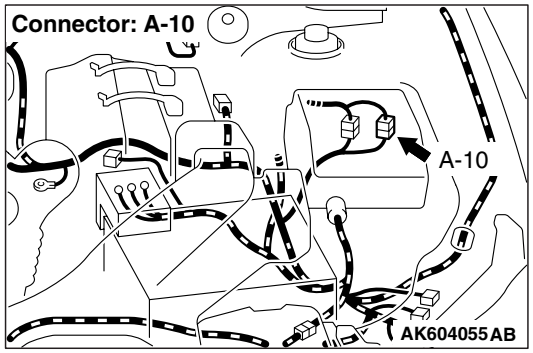

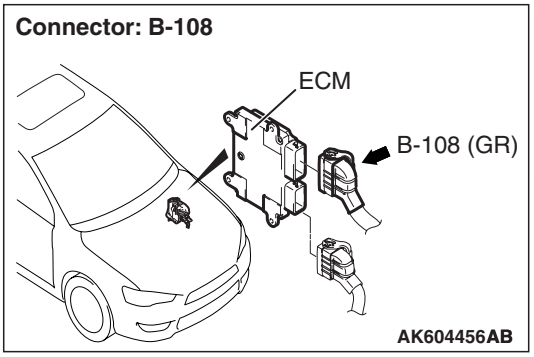

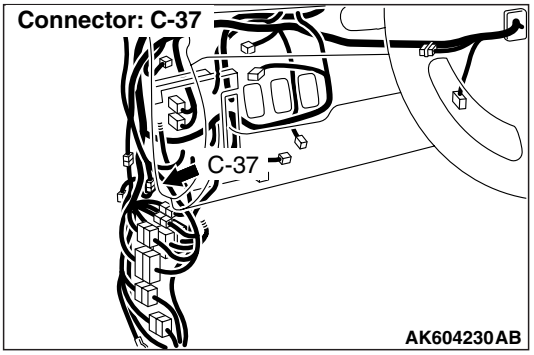

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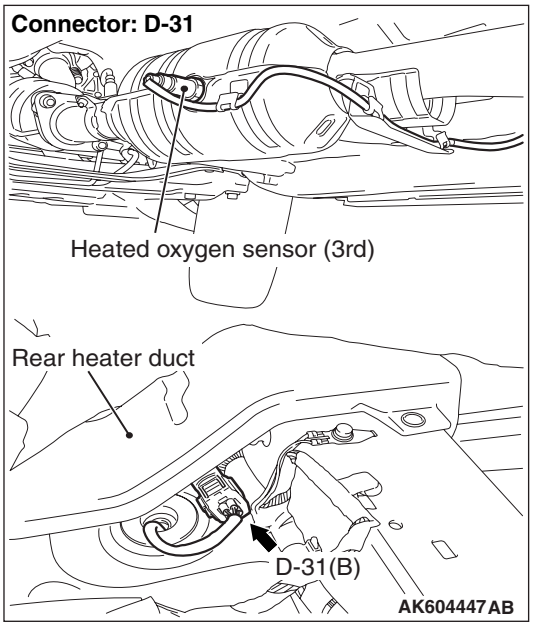


CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 3) of the heated oxygen sensor (3rd).
- Terminal No. 4 of the heated oxygen sensor (3rd) is grounded with ECM (terminal No. 55).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (3rd).

TECHNICAL DESCRIPTION

- The ECM checks for the heated oxygen sensor (3rd) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) output voltage is under the specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

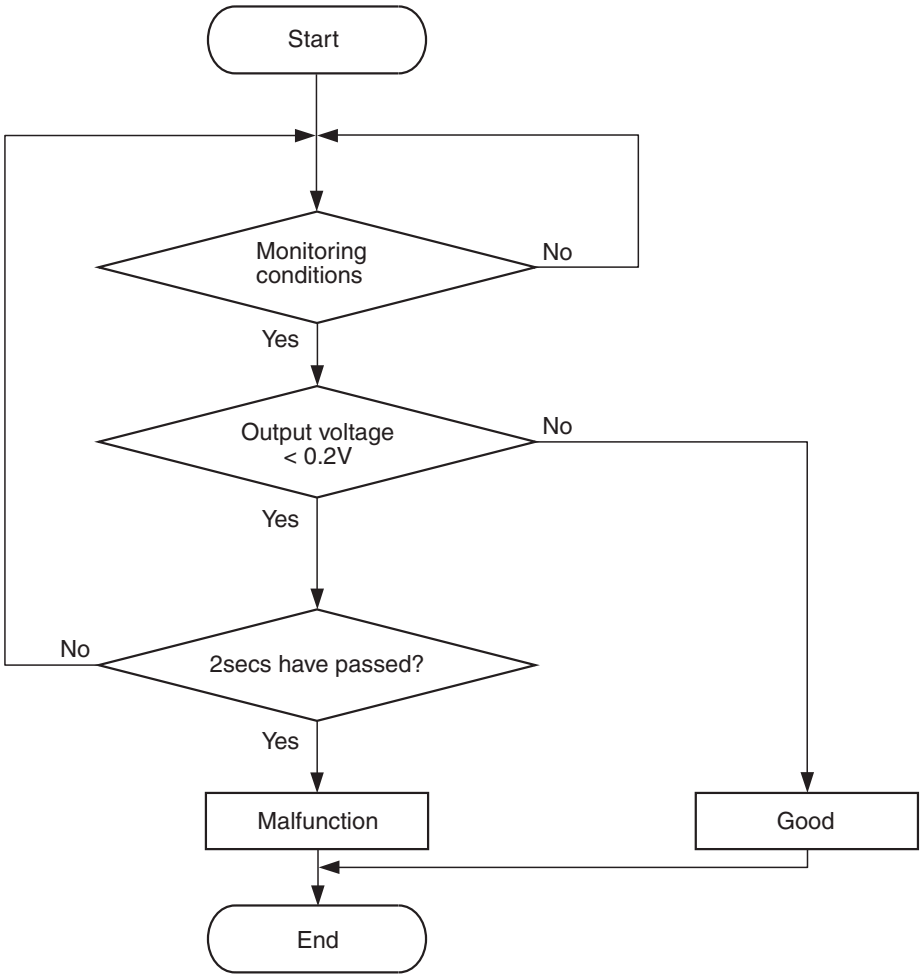
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor
- Heated oxygen sensor (3rd) monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.
- Battery positive voltage is between 11 and 16.5 volts.
- 3 minutes or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor (3rd) output voltage is lower than 0.2 volt for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (3rd) failed.
- Open or shorted circuit in heated oxygen sensor (3rd) output line or harness damage.
- Open circuit in heated oxygen sensor (3rd) ground line or harness damage.
- Connector damage.
- ECM failed.

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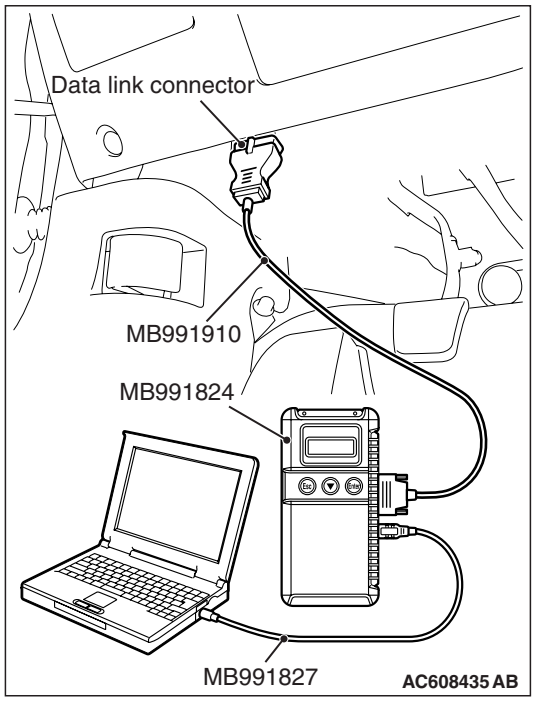
DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item B1: Heated Oxygen Sensor (3rd).



⚠ CAUTION

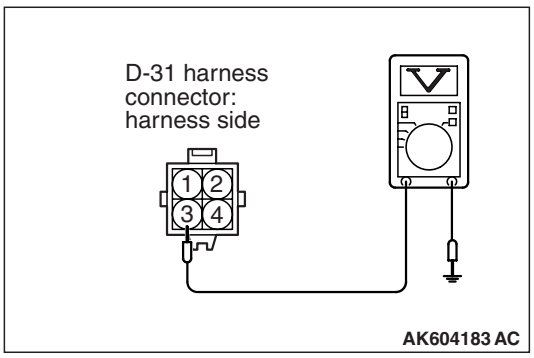
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item B1, Heated Oxygen Sensor (3rd).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Measure the sensor output voltage at heated oxygen sensor (3rd) connector D-31 by backprobing



(1) Do not disconnect the connector D-31.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 3 and ground by backprobing under the following driving.
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 1.0 and 1.5 volts.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 8.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

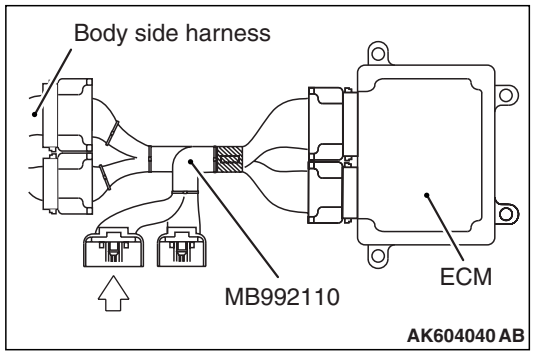
YES : Go to Step 4.

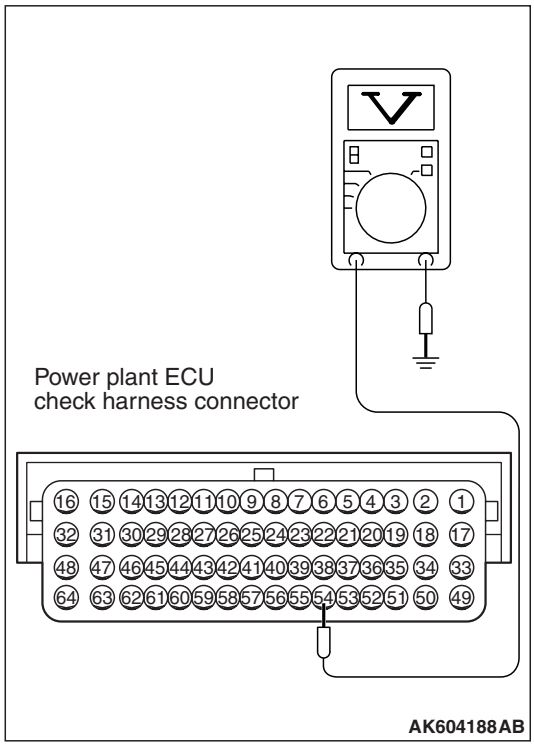
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 4. Measure the sensor output voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Start the engine and run at idle.





(3) Measure the voltage between terminal No. 54 and ground by backprobing under the following driving.
   a. Transaxle: 2nd speed (CVT: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min or more
      - The output voltage should be between 1.0 and 1.5 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 1.0 and 1.5 volts?

YES : Go to Step 5.

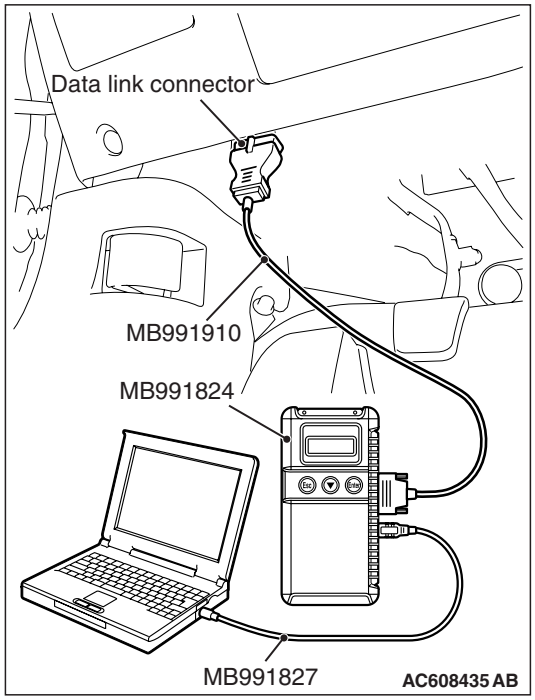
NO : Go to Step 7.

STEP 5. Check harness connector D-31 at heated oxygen sensor (3rd) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 6. Using scan tool MB991958, check data list item B1: Heated Oxygen Sensor (3rd).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item B1, Heated Oxygen Sensor (3rd).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min or more
    - The output voltage should be between 0.6 and 1.0 volt.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

STEP 7. Check harness connector D-31 at heated oxygen sensor (3rd) for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 and C-37 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between heated oxygen sensor (3rd) connector D-31 (terminal No. 3) and ECM connector B-108 (terminal No. 54) because of open circuit or harness damage. Then go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 8. Check harness connector D-31 at heated oxygen sensor (3rd) for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

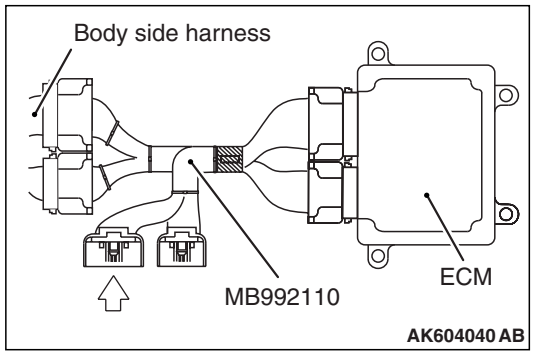
YES : Go to Step 10.

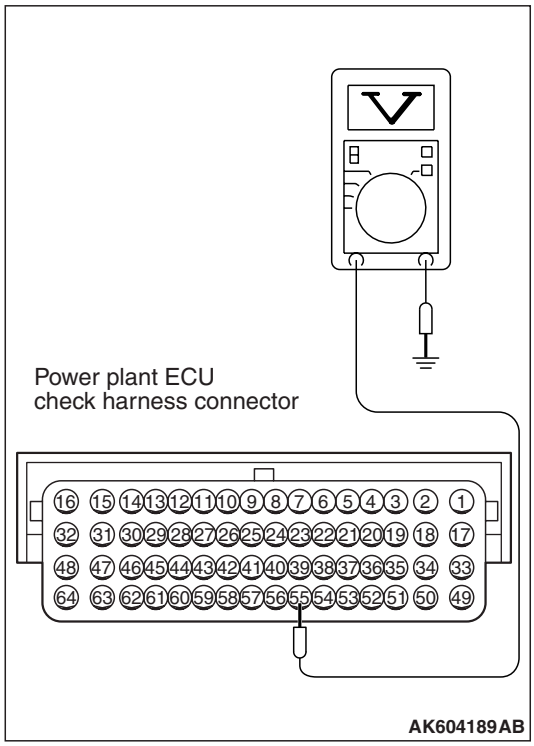
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Measure the sensor offset voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 55 and ground.
- Voltage should be between 0.4 and 0.6 volt.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 0.4 and 0.6 volt?

YES : Go to Step 11.

NO : Check harness connector A-10 and C-37 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between headed oxygen sensor (3rd) connector D-31 (terminal No. 4) and ECM connector B-108 (terminal No. 55) because of open circuit or harness damage. Then go to Step 14.

STEP 11. Check for harness damage between heated oxygen sensor (3rd) connector D-31 (terminal No. 4) and ECM connector B-108 (terminal No. 55).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for short circuit to ground and harness damage between heated oxygen sensor (3rd) connector D-31 (terminal No. 3) and ECM connector B-108 (terminal No. 54).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

Q: Is the harness wire in good condition?

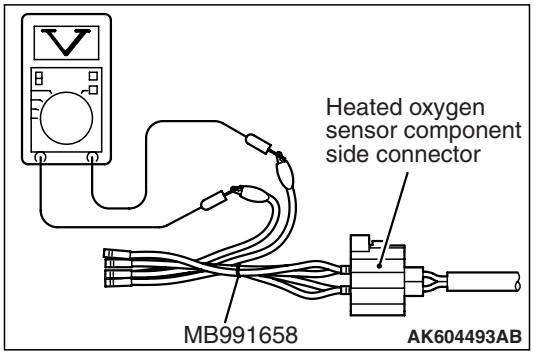
YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Check the heated oxygen sensor (3rd).

(1) Disconnect the heated oxygen sensor (3rd) connector D-31 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (3rd) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Drive at 50 km/h (31mph) or more for 10 minutes.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) Measure the output voltage of heated oxygen sensor under the following driving.
- Transaxle: 2nd speed (CVT: "L" range)
- Drive with wide open throttle
- Engine: 3,500 r/min or more

Standard value: 0.6 –1.0 V

NOTE: If the sufficiently high temperature [of approximately 400 °C (752 °F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio.



Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : Replace the heated oxygen sensor (3rd). Then go to Step 14.

TSB Revision

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

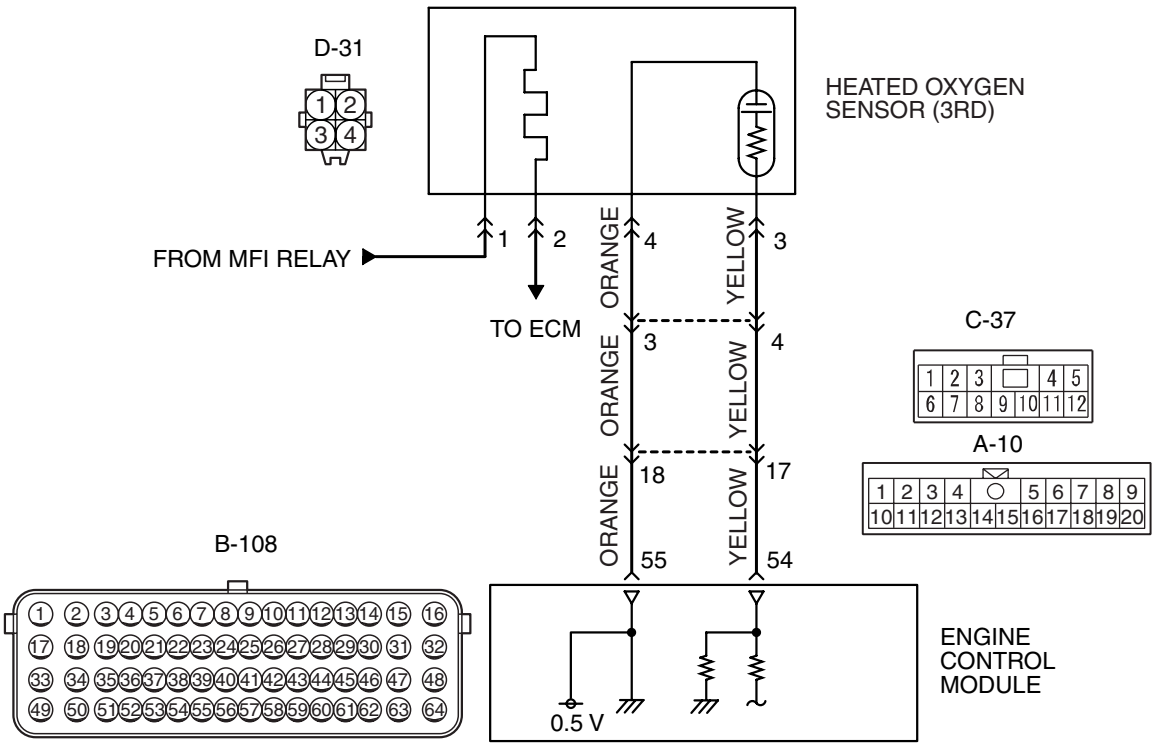
Q: Is DTC P0143 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0144: Heated Oxygen Sensor (3rd) Circuit High Voltage <California>

HEATED OXYGEN SENSOR (3RD) CIRCUIT <CALIFORNIA>



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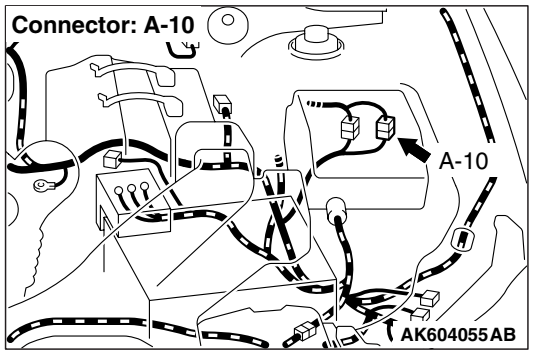
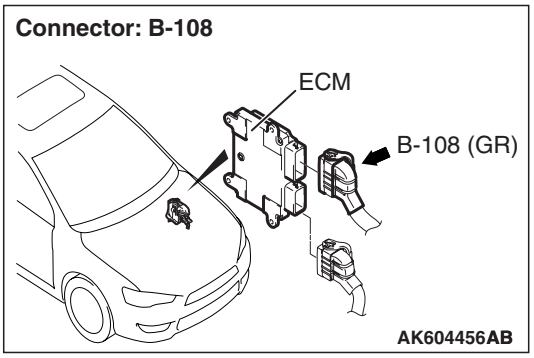
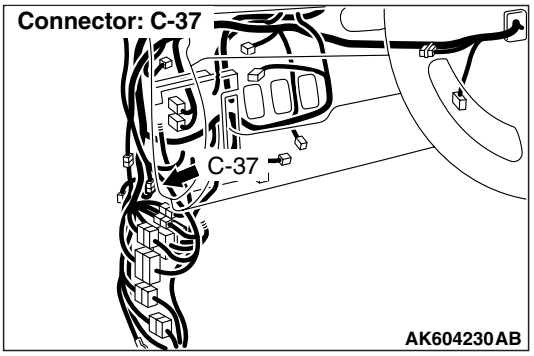
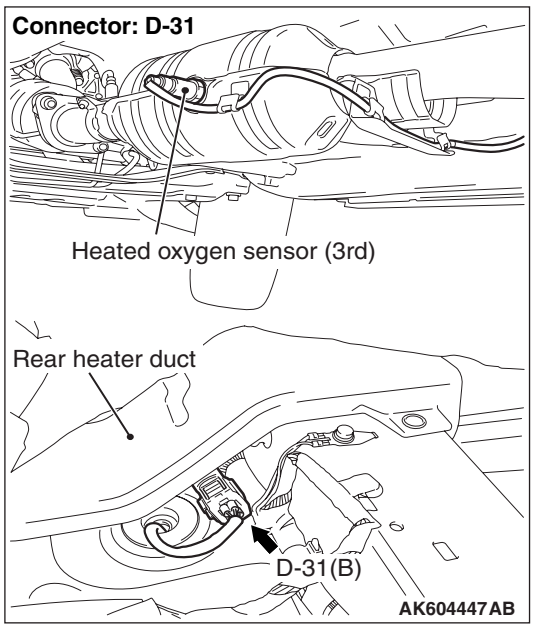








CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 3) of the heated oxygen sensor (3rd).
- Terminal No. 4 of the heated oxygen sensor (3rd) is grounded with ECM (terminal No. 55).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (3rd).

TECHNICAL DESCRIPTION

- The ECM checks for the heated oxygen sensor (3rd) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) output voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor
- Heated oxygen sensor (3rd) monitor

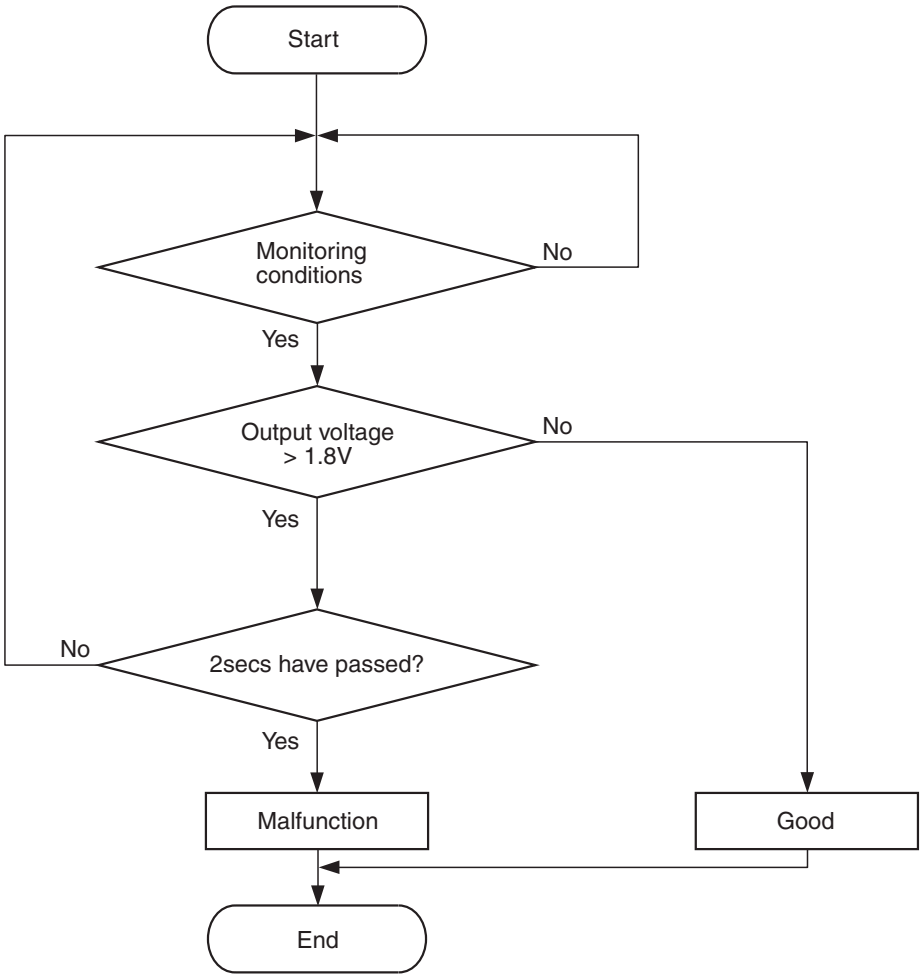
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Heated oxygen sensor offset voltage is between 0.4 and 0.6 volt.

Judgement Criterion

- Heated oxygen sensor (3rd) output voltage has continued to be 1.8 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Short circuit in heated oxygen sensor (3rd) output line.
- Connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

STEP 1. Check harness connector D-31 at heated oxygen sensor (3rd) and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

STEP 2. Check for short circuit to power supply between heated oxygen sensor (3rd) connector D-31 (terminal No. 3) and ECM connector B-108 (terminal No. 54).

NOTE: Check harness after checking intermediate connector A-10 and C-37. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

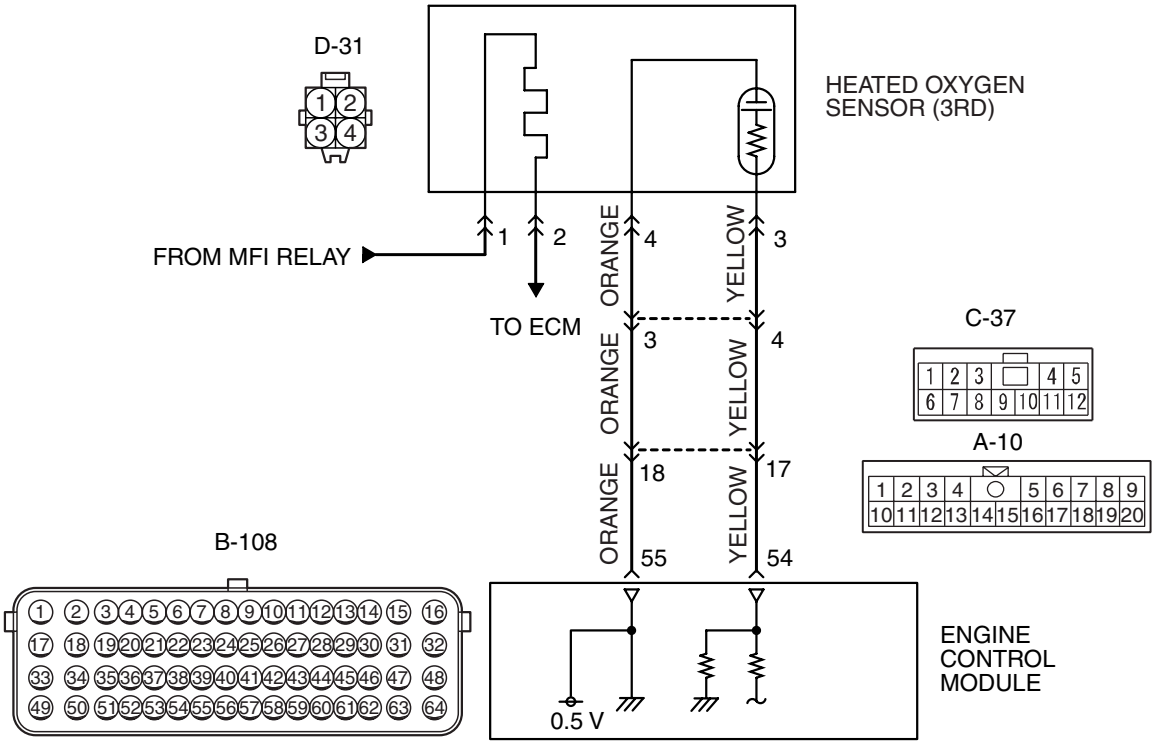
Q: Is DTC P0144 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0145: Heated Oxygen Sensor (3rd) Circuit Slow Responce <California>

HEATED OXYGEN SENSOR (3RD) CIRCUIT <CALIFORNIA>



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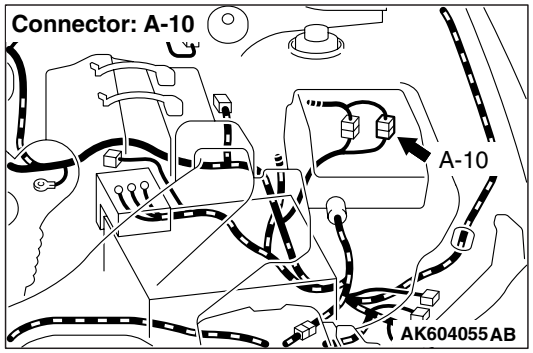

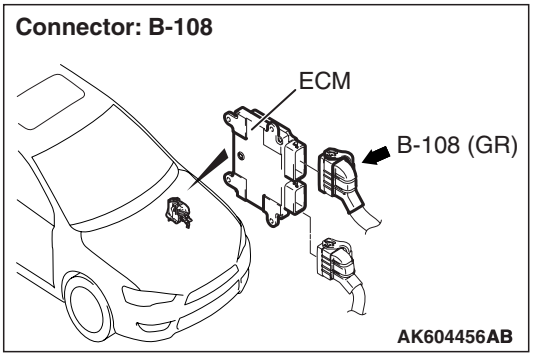

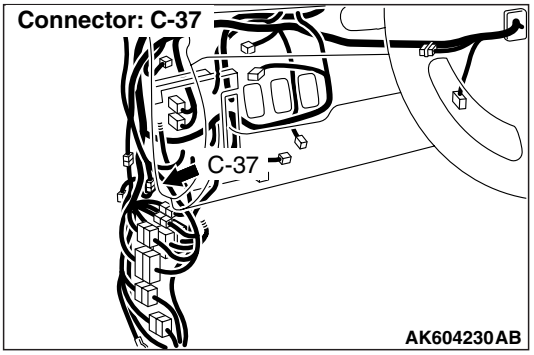

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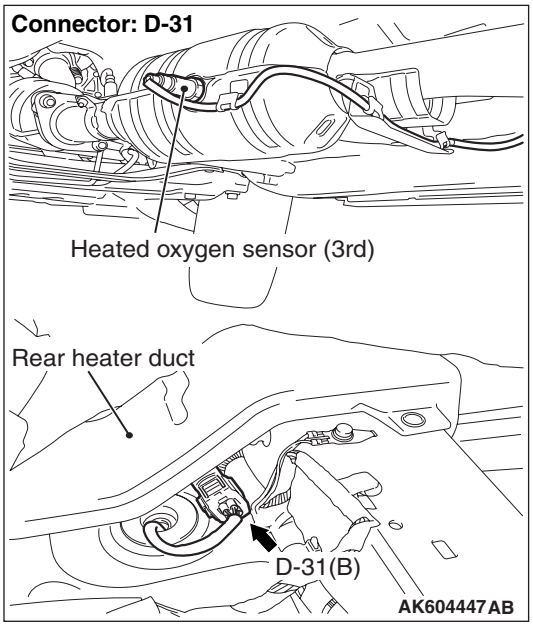


CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 3) of the heated oxygen sensor (3rd).
- Terminal No. 4 of the heated oxygen sensor (3rd) is grounded with ECM (terminal No. 55).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (3rd).

TECHNICAL DESCRIPTION

- The ECM checks for the heated oxygen sensor (3rd) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) output voltage does not reach 0.2 volt after fuel cut operation.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

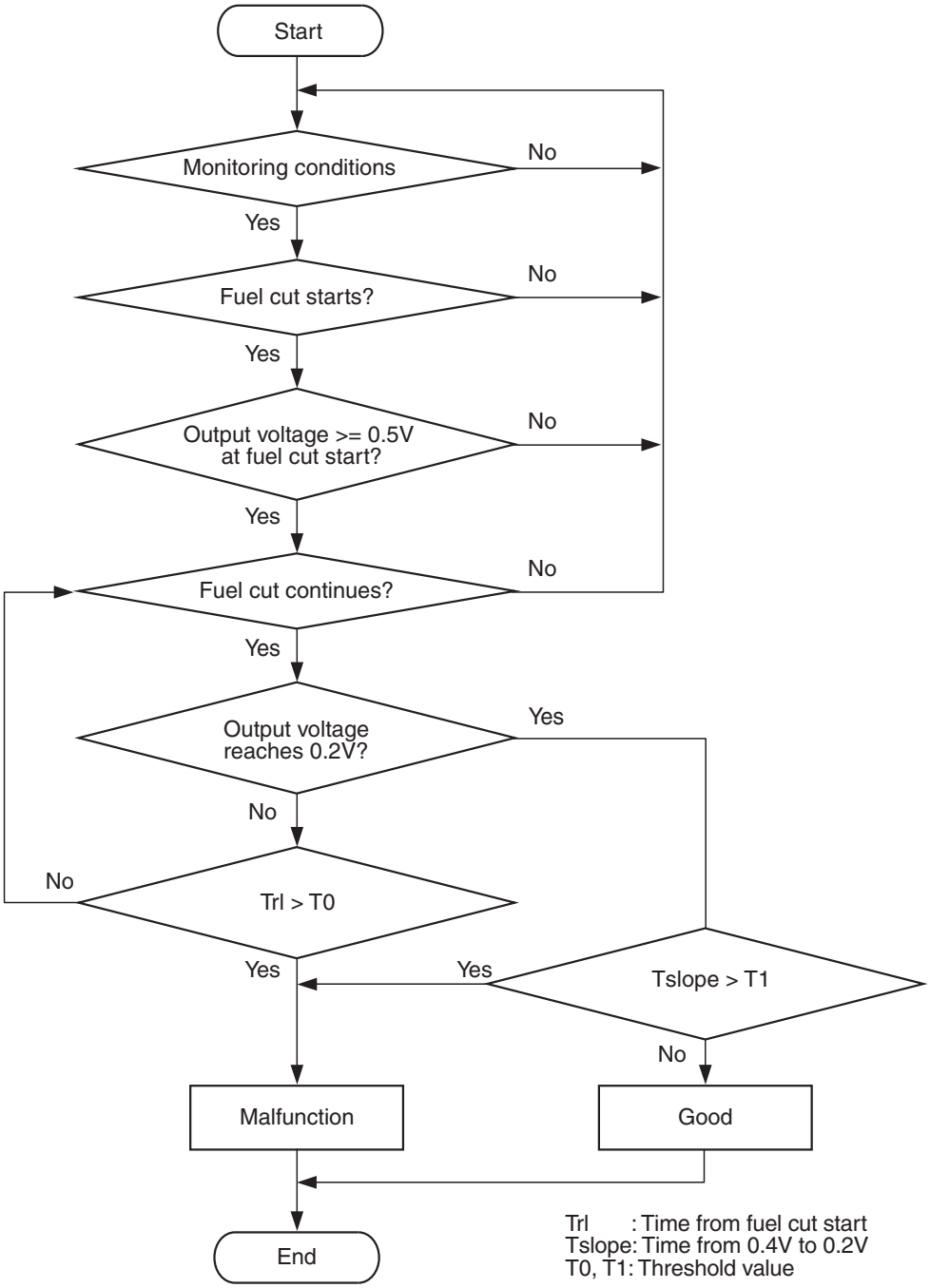
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor
- Heated oxygen sensor (3rd) monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 2,900 g.
- Fuel is being shut off.
- Heated oxygen sensor (3rd) output voltage is higher than 0.5 volt when fuel cut is started.

Judgement Criterion

- Heated oxygen sensor (3rd) output voltage does not reach 0.2 volt for 7 seconds from fuel cut start.

or

- Heated oxygen sensor (3rd) output voltage does not reach 0.2 volt for 1 second from 0.4 volt while fuel is being shut off.

TSB Revision

NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13A-10.

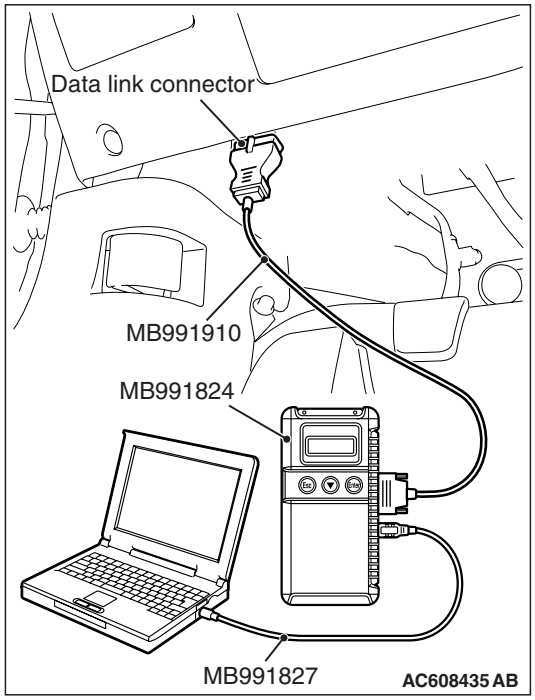
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (3rd) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item B1: Heated Oxygen Sensor (3rd).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item B1, Heated Oxygen Sensor (3rd).
(4) Warm up the engine.
  - After increasing the output voltage 0.5 volt or more by the engine revving, finish it. Then confirm that the output voltage reduces to 0.2 volt or less within 7 seconds.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the heated oxygen sensor (3rd). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

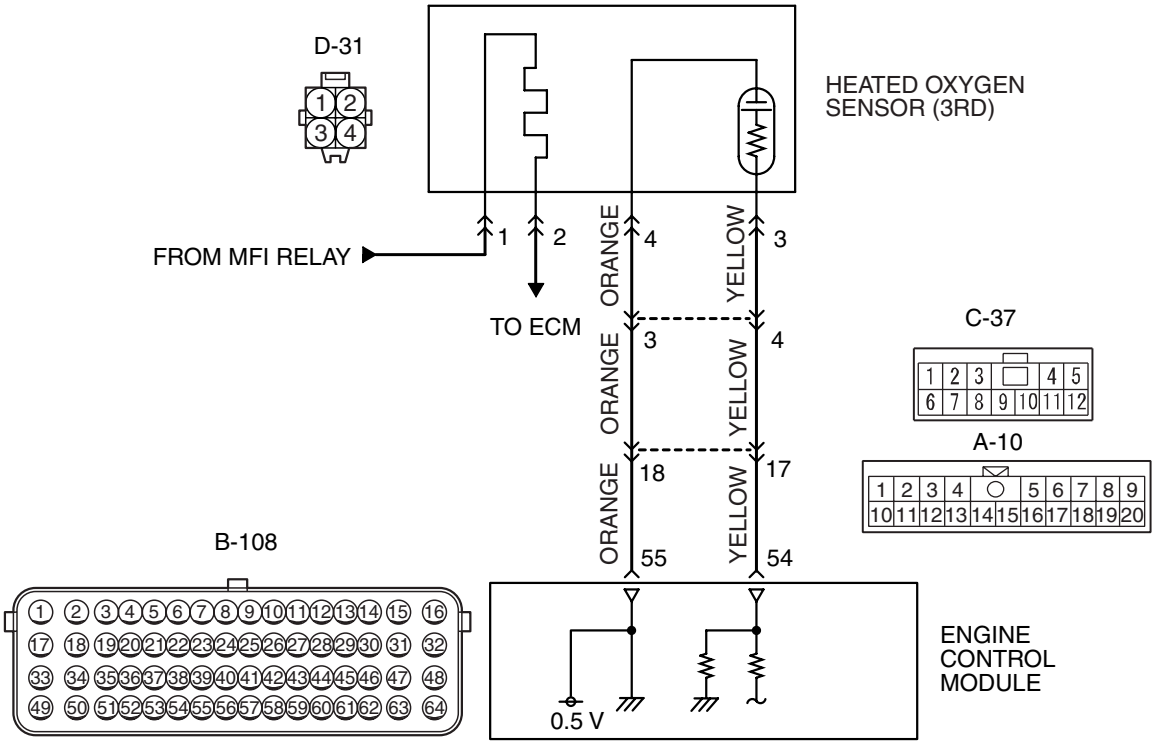
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0145 set?

YES : Refer to DTC P0143 –Heated Oxygen Sensor (3rd) Circuit Low Voltage P.13A-316, DTC P0144 –Heated Oxygen Sensor (3rd) Circuit High Voltage P.13A-324.
NO : The inspection is complete.

DTC P0146: Heated Oxygen Sensor (3rd) Circuit No Activity Detected <California>

HEATED OXYGEN SENSOR (3RD) CIRCUIT <CALIFORNIA>



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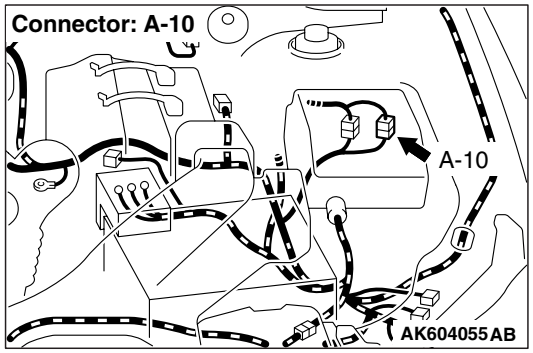

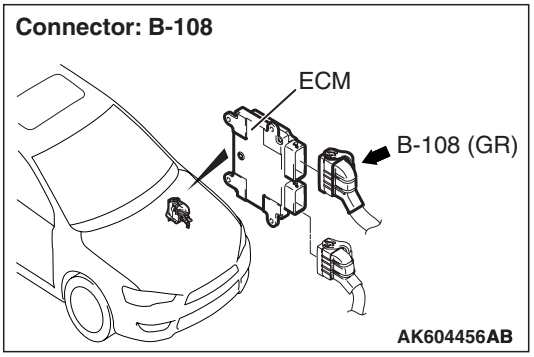

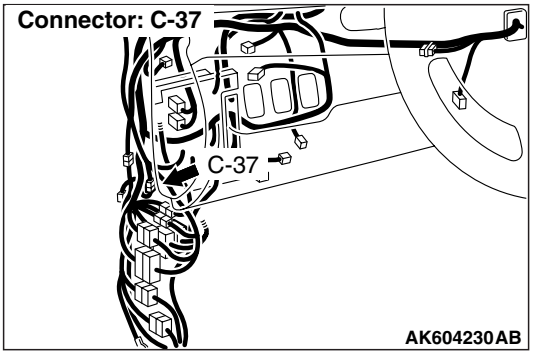

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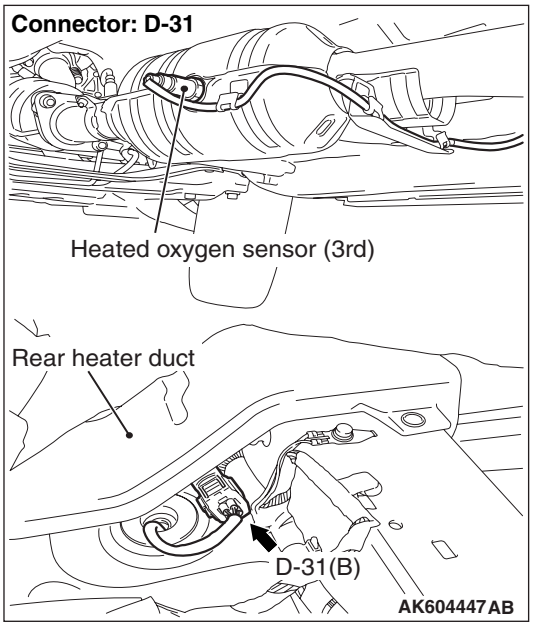


CIRCUIT OPERATION

- A voltage corresponding to the oxygen concentration in the exhaust gas is sent to the ECM (terminal No. 54) from the output terminal (terminal No. 3) of the heated oxygen sensor (3rd).
- Terminal No. 4 of the heated oxygen sensor (3rd) is grounded with ECM (terminal No. 55).
- The ECM applies an offset voltage of 0.5 volt to terminal No. 4 of the heated oxygen sensor (3rd).

TECHNICAL DESCRIPTION

- The ECM checks for the heated oxygen sensor (3rd) output voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (3rd) output voltage does not change during specified go/stop operations including fuel cut are repeated.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

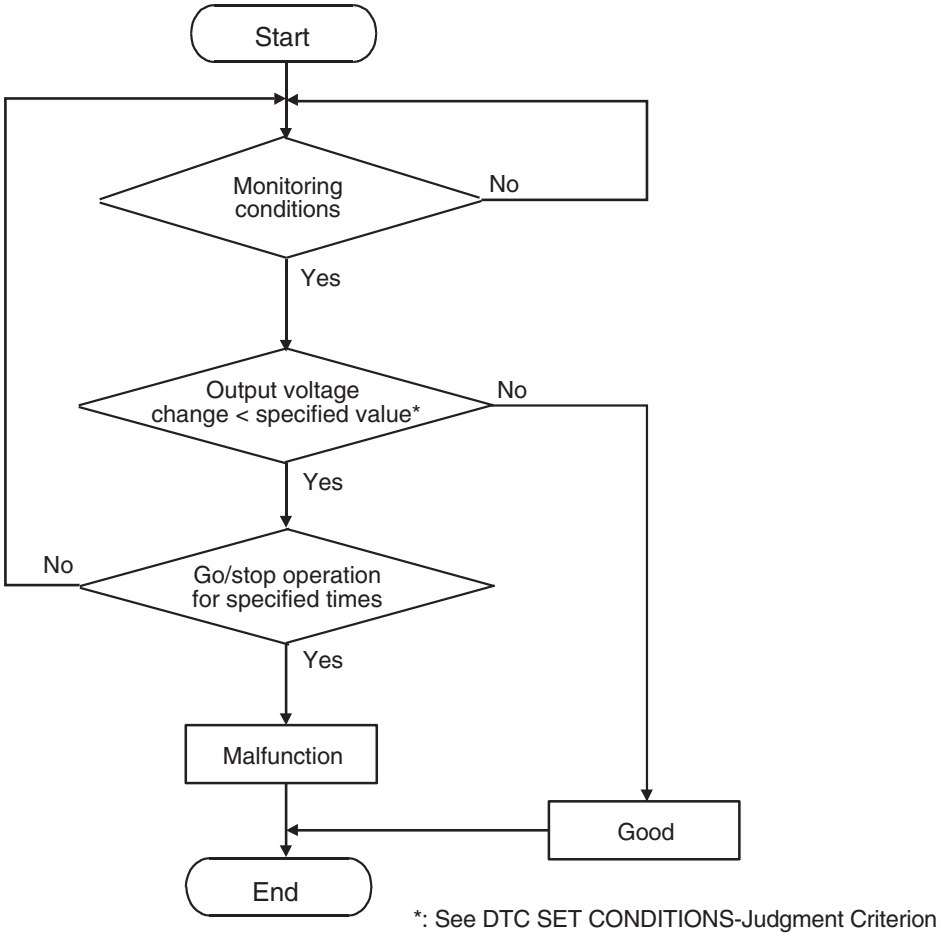
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Air/fuel ratio feedback monitor
- Heated oxygen sensor (3rd) monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- The heated oxygen sensor (front) is active.
- The cumulative mass airflow sensor output is higher than 2,900 g.
- Repeat 3 or more times: drive[*1], stop[*2].

  Drive[*1]:
  - Engine speed is higher than 1,500 r/min.
  - Volumetric efficiency is higher than 40 percent.
  - Vehicle speed is higher than 30 km/h (19 mph).
  - A total of more than 10 seconds have elapsed with the above mentioned conditions, and more than 2 seconds have elapsed with the fuel shut off.

  Stop[*2]:
  - Vehicle speed is lower than 1.5 km/h (1 mph).

Judgement Criterion

- Change in the output voltage of the heated oxygen sensor (3rd) is lower than 0.098 volt.

  NOTE: Monitoring stops after fuel has been shut off for more than 64 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 13 P.13A-10.

TSB Revision

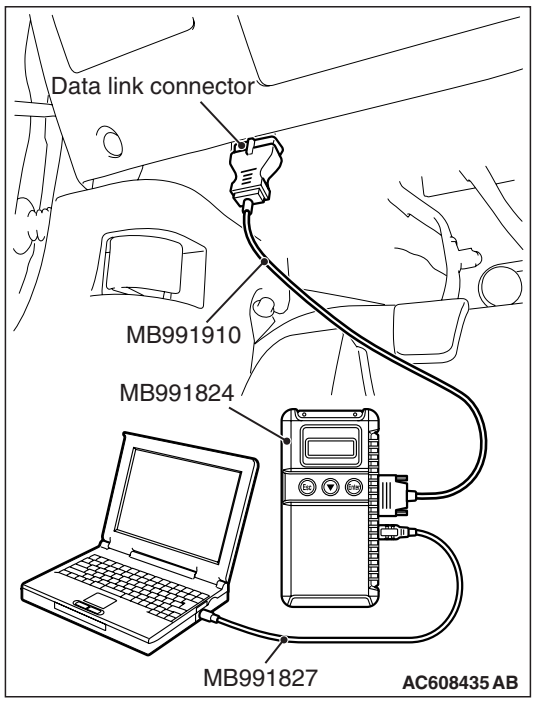
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (3rd) deteriorated.
- Connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item B1: Heated Oxygen Sensor (3rd).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item B1, Heated Oxygen Sensor (3rd).
  a. Transaxle: 2nd speed (CVT: "L" range)
  b. Drive with wide open throttle
  c. Engine: 3,500 r/min
    - The output voltages should be between 0.6 and 1.0 volt.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the heated oxygen sensor (3rd). Then go to Step 2.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 13 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0146 set?

YES : Refer to DTC P0143 –Heated Oxygen Sensor (3rd) Circuit Low Voltage P.13A-316, DTC P0144 –Heated Oxygen Sensor (3rd) Circuit High Voltage P.13A-324.
NO : The inspection is complete.

DTC P0171: System too Lean

Fuel Trim Circuit

- Refer to DTC P0201 –Injector Circuit-Cylinder 1 P.13A-367, DTC P0202 –Injector Circuit-Cylinder 2 P.13A-377, DTC P0203 –Injector Circuit-Cylinder 3 P.13A-387, DTC P0204 –Injector Circuit-Cylinder 4 P.13A-397.

CIRCUIT OPERATION

- Refer to DTC P0201 –Injector Circuit-Cylinder 1 P.13A-367, DTC P0202 –Injector Circuit-Cylinder 2 P.13A-377, DTC P0203 –Injector Circuit-Cylinder 3 P.13A-387, DTC P0204 –Injector Circuit-Cylinder 4 P.13A-397.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too large.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too lean.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

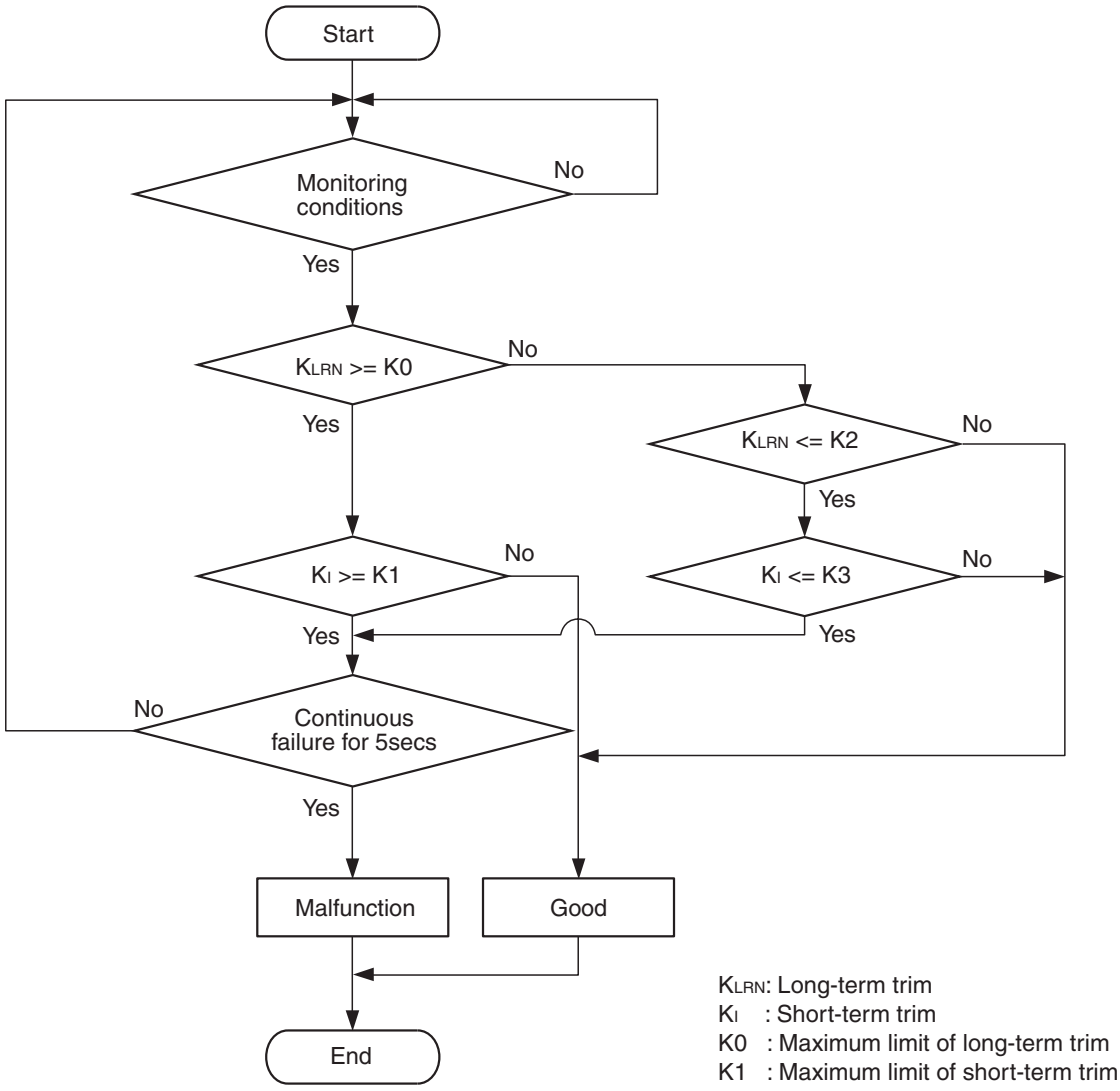
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604328

Check Conditions

- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or more.

Judgement Criterion

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +7.0 percent <Except for California> or +5.5 percent <California> for 5 seconds.

Check Conditions

- Engine coolant temperature is lower than 100° C (212° F) when the engine is started.
- Intake air temperature is lower than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.

TSB Revision

- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or less.

Judgement Criterion

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +12.1 percent <Except for California> or +10.5 percent <California> for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or more.

Judgement Criteria

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +17.2 percent <Except for California> or +15.6 percent <California> for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 100° C (212° F) when the engine is started.
- Intake air temperature is higher than 60° C (140° F) when the engine is started.
- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or less.

Judgement Criterion

- Long-term fuel trim has continued to be higher than +12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be higher than +22.3 percent <Except for California> or +20.7 percent <California> for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criterion

- Long-term fuel trim has continued to be +12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be +25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Air drawn in from gaps in gasket, seals, etc.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- Exhaust leak.
- Use of incorrect or contaminated fuel.
- Harness damage in injector circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check for exhaust leak.

Q: Are there any abnormalities?

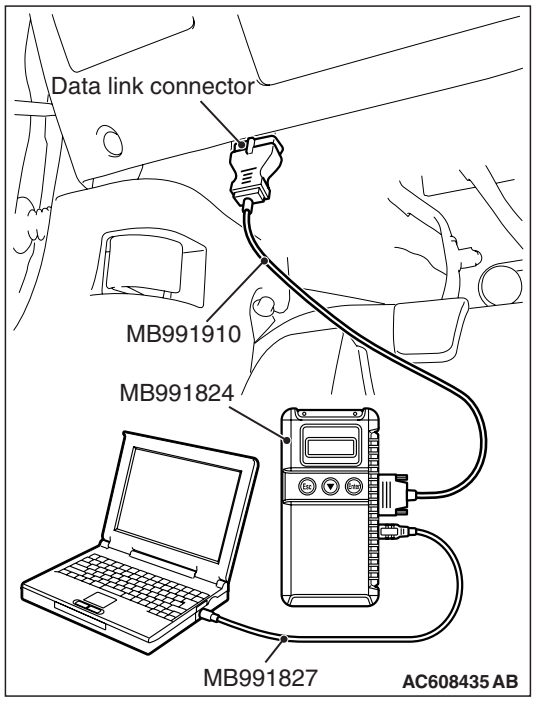
YES : Repair it. Then go to Step 14.
NO : Go to Step 2.

STEP 2. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 14.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.



⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- When idling, between 1,350 and 1,670 millivolts.
- When 2,500 r/min, between 1,620 and 2,020 millivolts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13A-131, DTC P0102 –Mass Airflow Circuit Low Input P.13A-137, DTC P0103 –Mass Airflow Circuit High Input P.13A-144.

STEP 4. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13A-171, DTC P0112 –Intake Air Temperature Circuit Low Input P.13A-177, DTC P0113 –Intake Air Temperature Circuit High Input P.13A-181.

STEP 5. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 6.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-187, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13A-193, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13A-198.

STEP 6. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

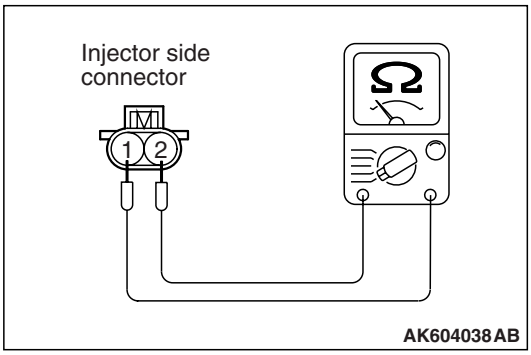
Q: Is the sensor operating properly?

YES : Go to Step 7.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-149, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13A-158, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13A-166.

STEP 7. Check harness connector B-101, B-102, B-103 and B104 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



STEP 8. Check the injector.

(1) Disconnect the injector connector B-101, B-102, B-103 and B104.

(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 9.

NO : Replace the injector. Then go to Step 14.

STEP 9. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 10. Check for harness damage between injector connector and ECM connector.

a. Check the harness wire between injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) at No. 1 cylinder injector.

b. Check the harness wire between injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No.3) at No. 2 cylinder injector.

c. Check the harness wire between injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) at No. 3 cylinder injector.

d. Check the harness wire between injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) at No. 4 cylinder injector.

Q: Is the harness wire in good condition?

YES : Go to Step 11.

NO : Repair it. Then go to Step 14.

STEP 11. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 12.

NO : Repair it. Then go to Step 14.

STEP 12. Check for entry of foreign matter (water, kerosene, etc.) into fuel.

Q: Are there any abnormalities?

YES : Replace the fuel. Then go to Step 14.

NO : Go to Step 13.

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STEP 13. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0171 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : The inspection is complete.

STEP 14. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is the DTC P0171 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0172: System too Rich

Fuel Trim Circuit

- Refer to DTC P0201 –Injector Circuit-Cylinder 1 P.13A-367, DTC P0202 –Injector Circuit-Cylinder 2 P.13A-377, DTC P0203 –Injector Circuit-Cylinder 3 P.13A-387, DTC P0204 –Injector Circuit-Cylinder 4 P.13A-397.

CIRCUIT OPERATION

- Refer to DTC P0201 –Injector Circuit-Cylinder 1 P.13A-367, DTC P0202 –Injector Circuit-Cylinder 2 P.13A-377, DTC P0203 –Injector Circuit-Cylinder 3 P.13A-387, DTC P0204 –Injector Circuit-Cylinder 4 P.13A-397.

TECHNICAL DESCRIPTION

- If a malfunction occurs in the fuel system, the fuel trim value becomes too small.
- The ECM checks whether the fuel trim value is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Air/fuel learning value (long time fuel trim) and air/fuel feedback integral value (short time fuel trim) are too rich.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

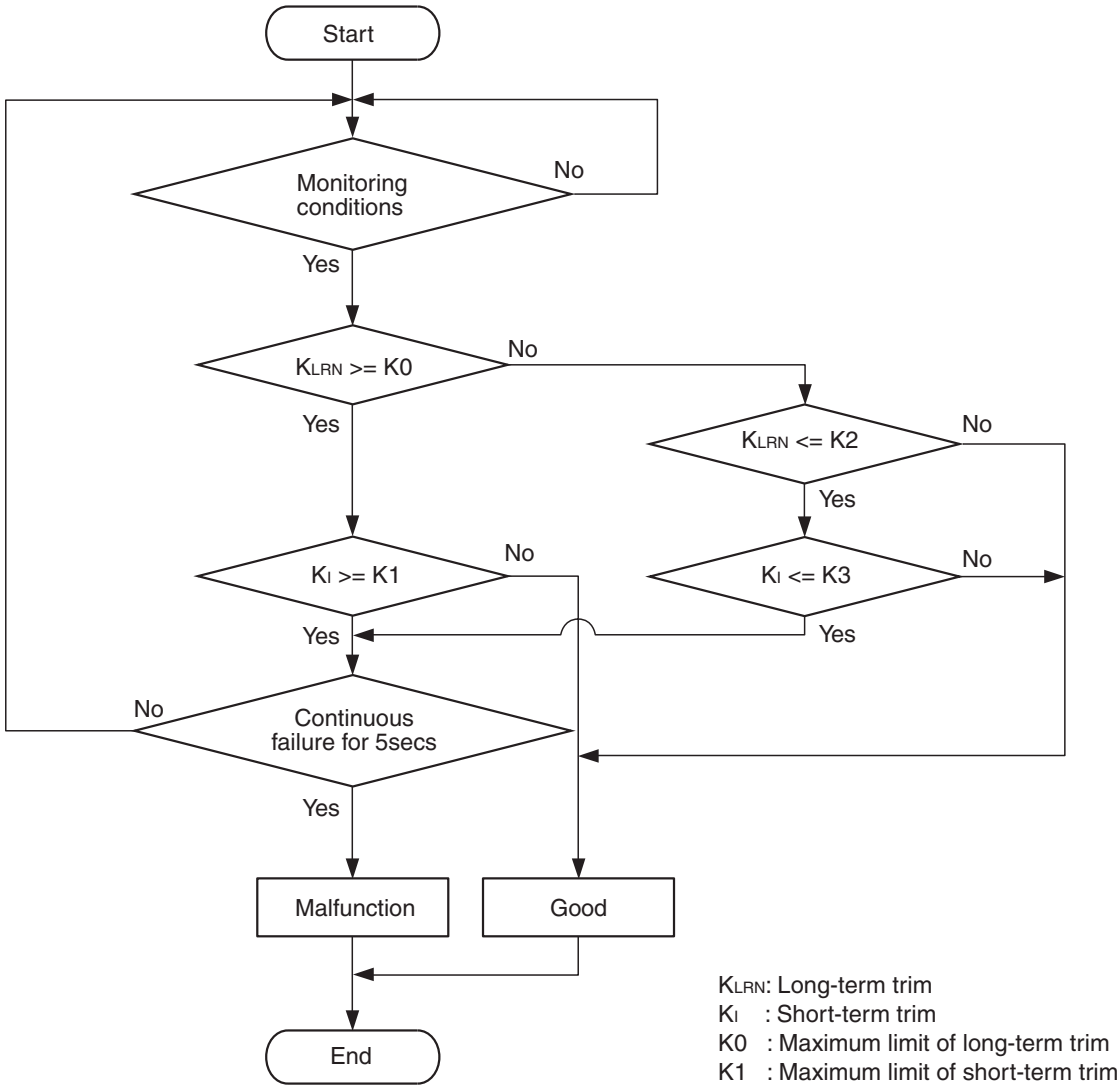
- Misfire monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604328

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or more.

Judgement Criterion

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

or

- Short-term fuel trim has continued to be lower than –10.2 percent <Except for California> or –5.5 percent <California> for 5 seconds.

Check Conditions

- Under the closed loop air/fuel ratio control.
- Engine coolant temperature is higher than 76° C (169° F).
- Mass airflow sensor output is 10 g/sec <M/T> or 6 g/sec <CVT> or less.

Judgement Criterion

- Long-term fuel trim has continued to be lower than –12.5 percent for 5 seconds.

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or

- Short-term fuel trim has continued to be lower than –15.2 percent <Except for California> or –10.5 percent <California> for 5 seconds.

Check Conditions

- Engine coolant temperature is higher than 76° C (169° F).
- Under the closed loop air/fuel ratio control.

Judgement Criteria

- Long-term fuel trim has continued to be –12.5 percent for 2 seconds.

or

- Short-term fuel trim has continued to be –25.0 percent for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 21 P.13A-10.

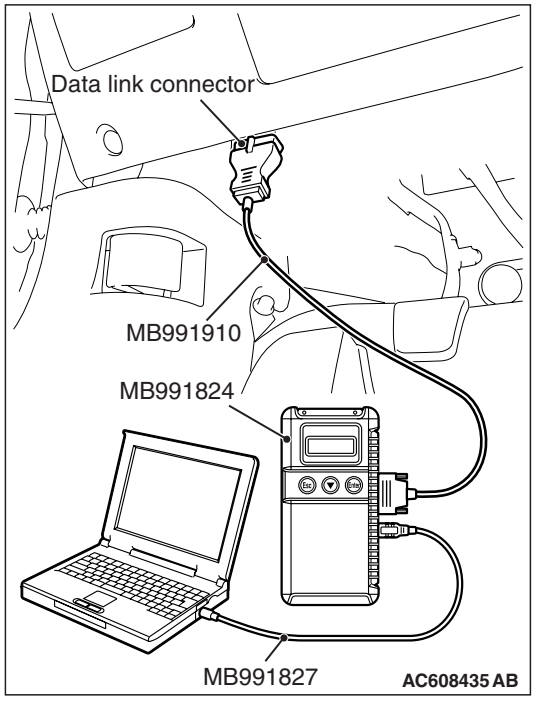
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor failed.
- Injector failed.
- Incorrect fuel pressure.
- Engine coolant temperature sensor failed.
- Intake air temperature sensor failed.
- Barometric pressure sensor failed.
- Manifold absolute pressure sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - When idling, between 1,350 and 1,670 millivolts.
  - When 2,500 r/min, between 1,620 and 2,020 millivolts.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : YES: Go to Step 2.
NO : Refer to DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13A-131, DTC P0102 –Mass Airflow Circuit Low Input P.13A-137, DTC P0103 –Mass Airflow Circuit High Input P.13A-144.

STEP 2. Using scan tool MB991958, check data list item 5: Intake Air Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 5, Intake Air Temperature Sensor.
- The intake air temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to DTC P0111 –Intake Air Temperature Circuit Range/Performance Problem P.13A-171, DTC P0112 –Intake Air Temperature Circuit Low Input P.13A-177, DTC P0113 –Intake Air Temperature Circuit High Input P.13A-181.

STEP 3. Using scan tool MB991958, check data list item 6: Engine Coolant Temperature Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 6, Engine Coolant Temperature Sensor.
- The engine coolant temperature and temperature shown with the scan tool should approximately match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Refer to DTC P0116 –Engine Coolant Temperature Circuit Range/Performance ProblemP.13A-187, DTC P0117 –Engine Coolant Temperature Circuit Low Input P.13A-193, DTC P0118 –Engine Coolant Temperature Circuit High Input P.13A-198.

STEP 4. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
- When altitude is 0 m (0 foot), 101 kPa (29.8 in.Hg).
- When altitude is 600 m (1,969 feet), 95 kPa (28.1 in.Hg).
- When altitude is 1,200 m (3,937 feet), 88 kPa (26.0 in.Hg).
- When altitude is 1,800 m (5,906 feet), 81 kPa (23.9 in.Hg).

(3) Start the engine.
- When the engine is idling, 16 –36 kPa (4.7 –10.6 in.Hg).
- When the engine is suddenly revved, manifold absolute pressure varies.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

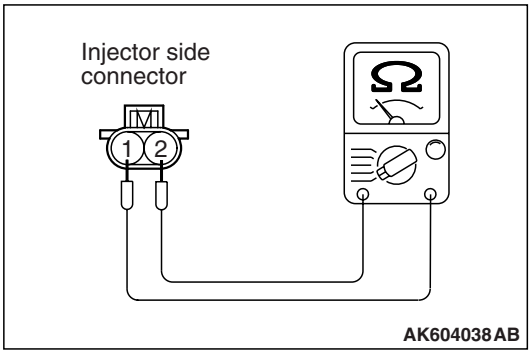
Q: Is the sensor operating properly?

YES : Go to Step 5.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Circuit Range/Performance Problem P.13A-149, DTC P0107 –Manifold Absolute Pressure Circuit Low Input P.13A-158, DTC P0108 –Manifold Absolute Pressure Circuit High Input P.13A-166.

STEP 5. Check the injector.

(1) Disconnect the injector connector B-101, B-102, B-103 and B-104.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 6.
NO : Replace the injector. Then go to Step 8.

STEP 6. Check the fuel pressure.

Refer to On-vehicle Service –Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 7.
NO : Repair it. Then go to Step 8.

STEP 7. Replace the injector.

(1) Replace the injector.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Test the OBD-II drive cycle.

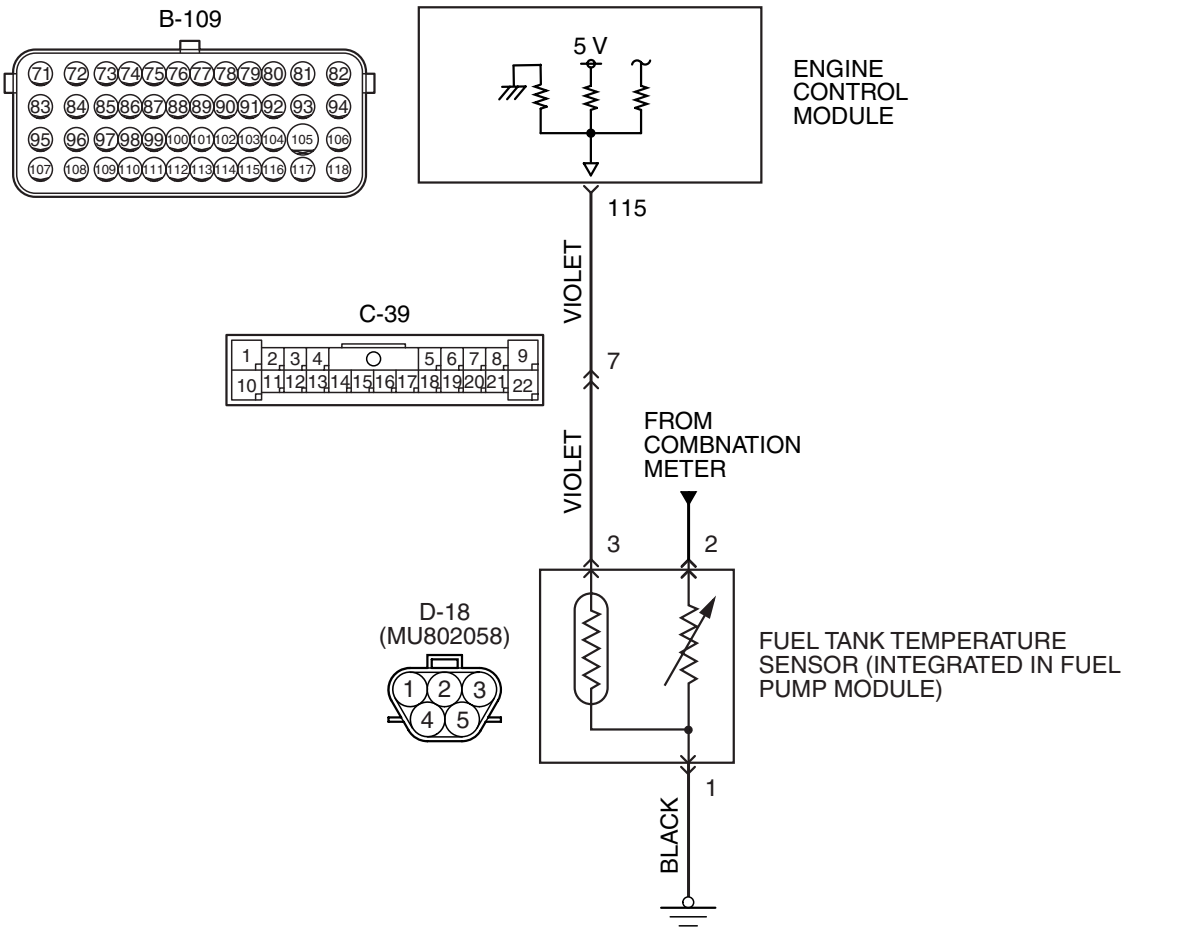
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 21 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0172 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0181: Fuel Tank Temperature Sensor Circuit Range/Performance

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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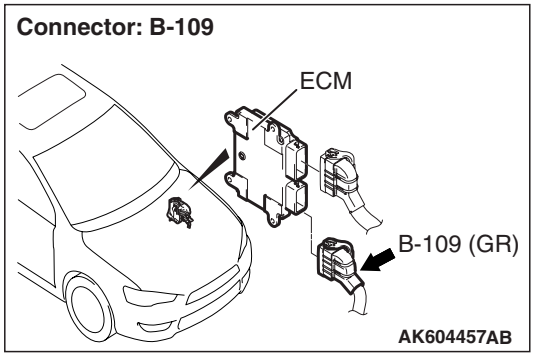

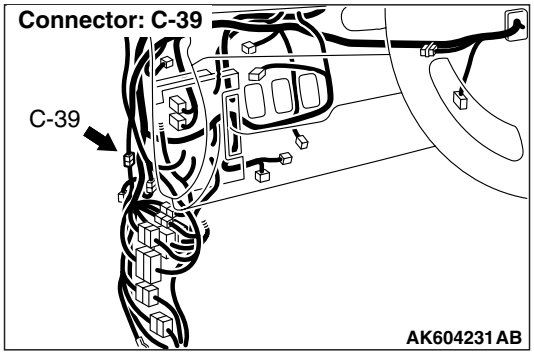

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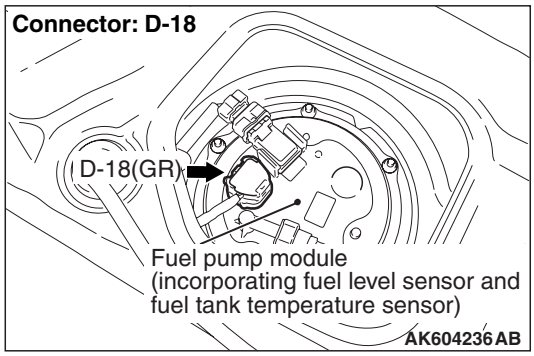


CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature at engine start is higher than engine coolant temperature at engine start by specified value when engine is cold start condition.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

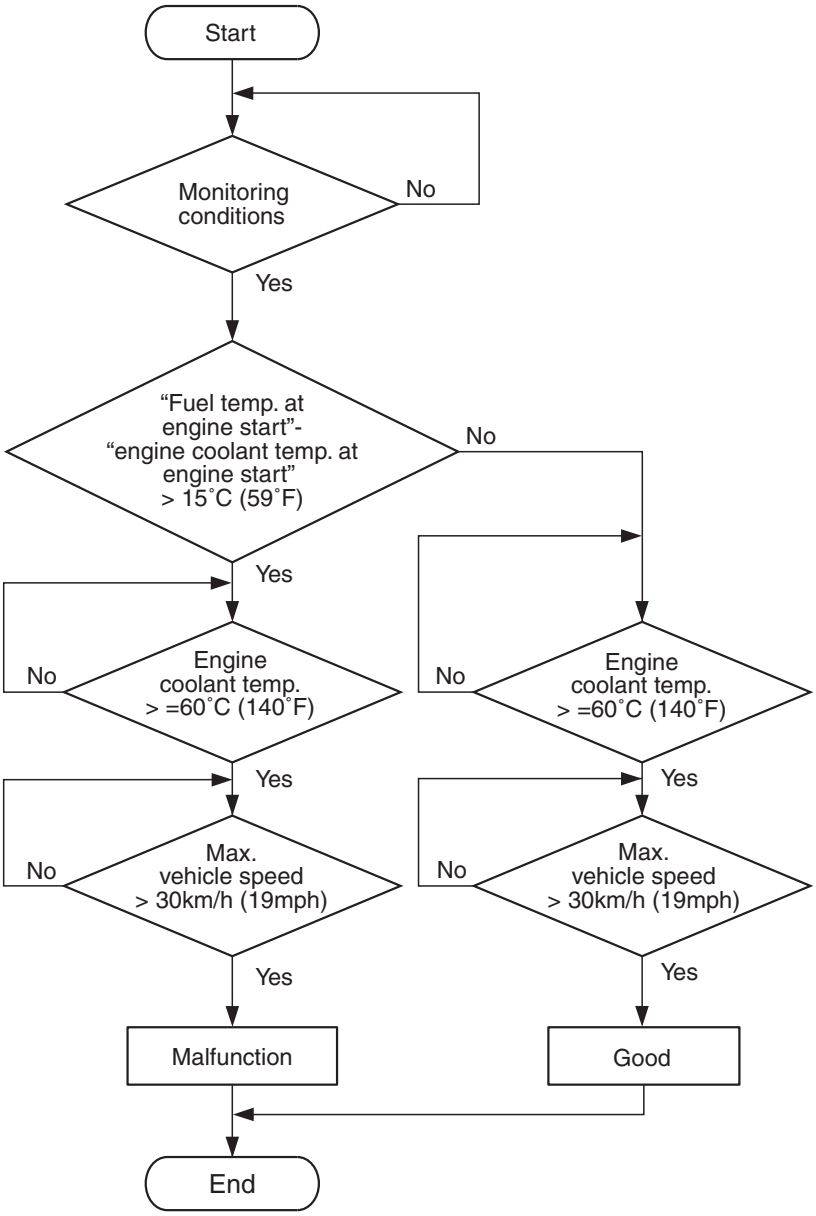
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The engine coolant temperature –intake air temperature is 5° C (9° F) or less when the engine is started.
- The engine coolant temperature is between –10° C (14° F) and 36° C (97° F) when the engine is started.
- The engine coolant temperature is higher than 60° C (140° F).
- Maximum vehicle speed is higher than 30 km/h (19 mph) after the engine starting sequence has been completed.

Judgement Criterion

- The fuel tank temperature –engine coolant temperature is 15° C (27° F) or more when the engine is started.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 14 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

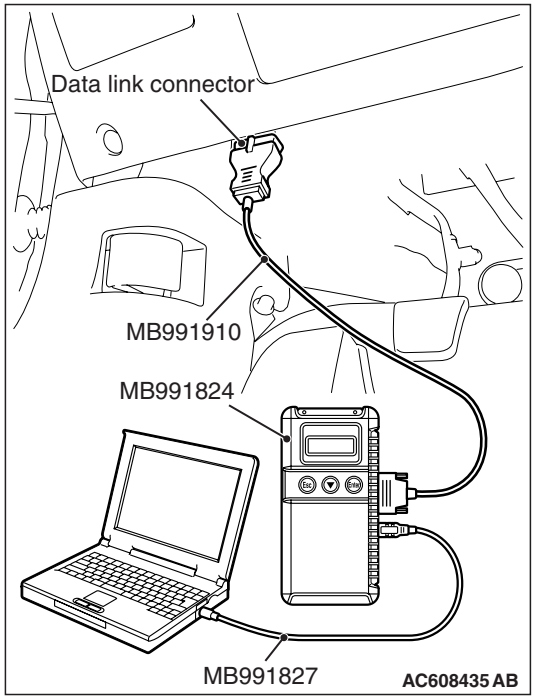
- Fuel tank temperature sensor failed.
- Open or shorted fuel tank temperature sensor circuit, harness damage, or connector damage.
- ECM failed.

NOTE: A diagnostic trouble code (DTC) could be output if the engine and the radiator have been flushed repeatedly when the engine coolant temperature was high (or the fuel tank temperature was high). Because this is not a failure, the DTC must be erased.
Make sure to test drive the vehicle in accordance with the OBD-II drive cycle pattern in order to verify that a DTC will not be output.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

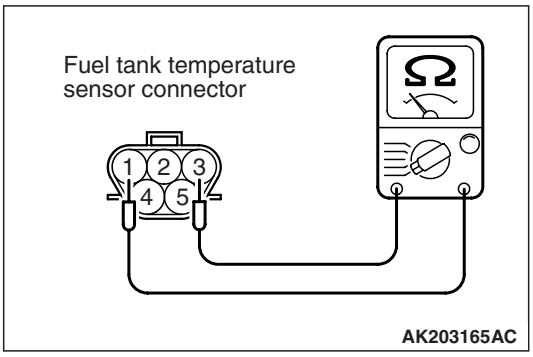
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



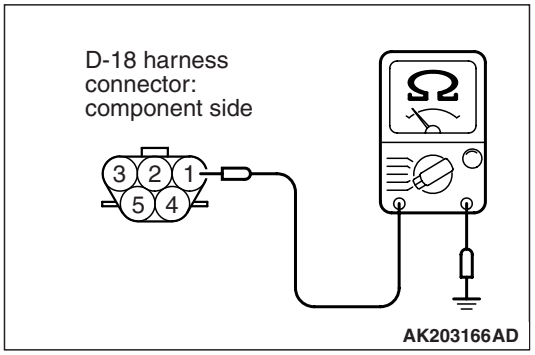
STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 –12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 11.

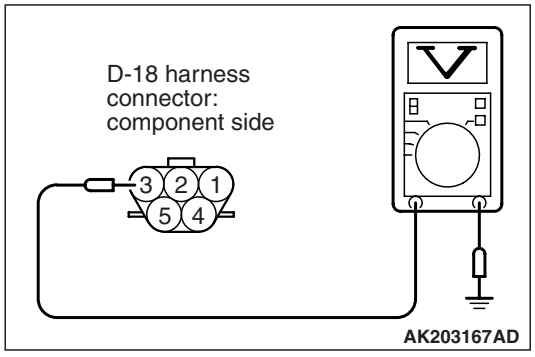


STEP 4. Check the continuity at fuel tank temperature sensor harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 5.
NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 11.



STEP 5. Measure the sensor supply voltage at fuel tank temperature sensor harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Go to Step 9.
NO : Go to Step 6.

STEP 6. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

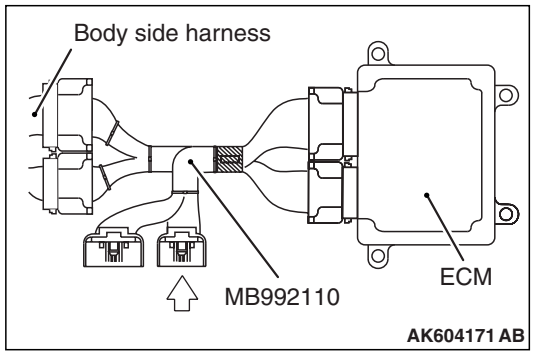
YES : Go to Step 7.

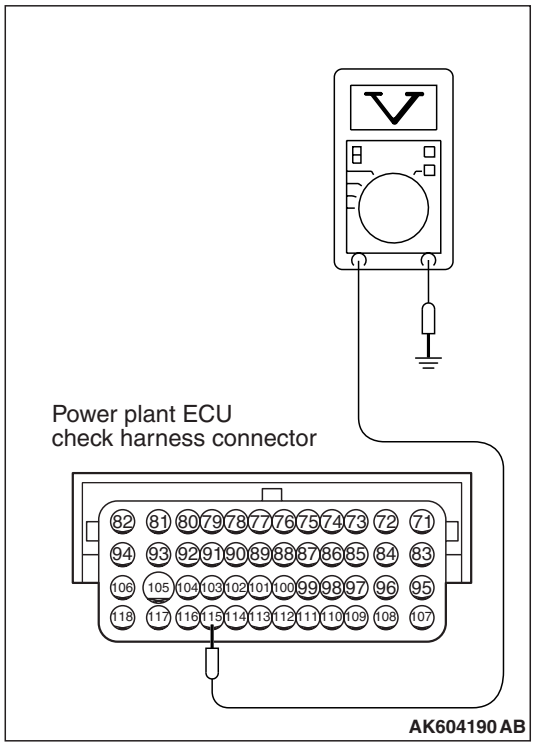
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 7. Measure the sensor supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 115 and ground.
- When fuel tank temperature is 0° C (32° F), voltage should be between 2.7 and 3.1 volts.
- When fuel tank temperature is 20° C (68° F), voltage should be between 2.1 and 2.5 volts.
- When fuel tank temperature is 40° C (104° F), voltage should be between 1.6 and 2.0 volts.
- When fuel tank temperature is 80° C (176° F), voltage should be between 0.8 and 1.2 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage normal?

YES : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115) because of open circuit. Then go to Step 11.

NO : Go to Step 8.

STEP 8. Check for short circuit to ground between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-39. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 9. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 10. Check for harness damage between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-39. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 14 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

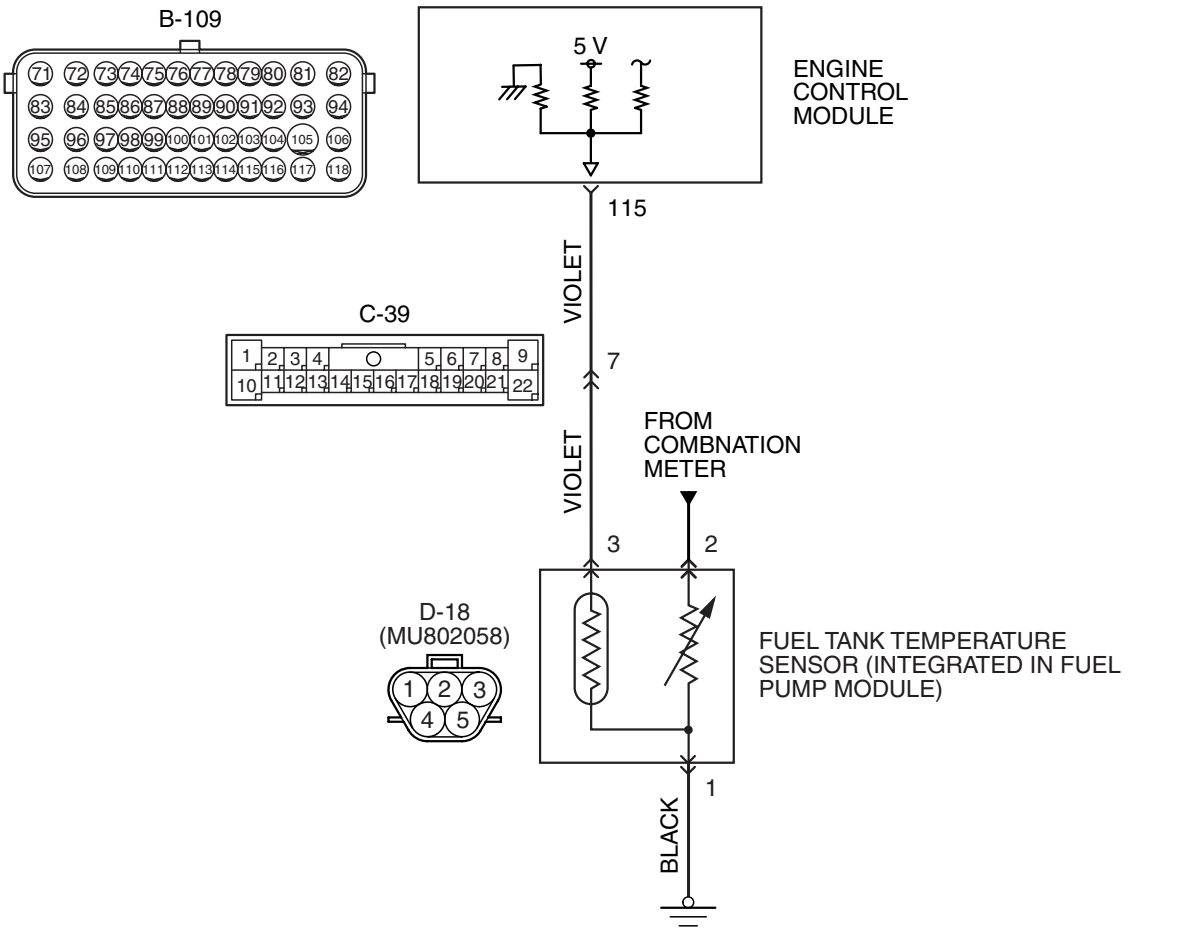
Q: Is DTC P0181 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0182: Fuel Tank Temperature Sensor Circuit Low Input

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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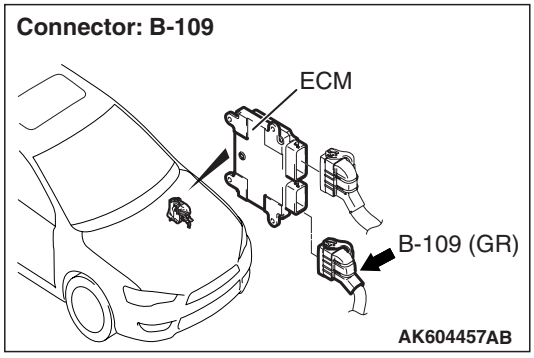

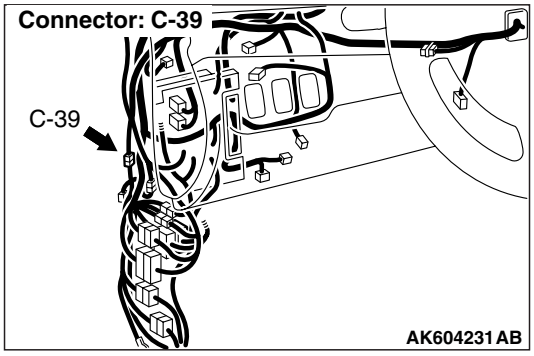

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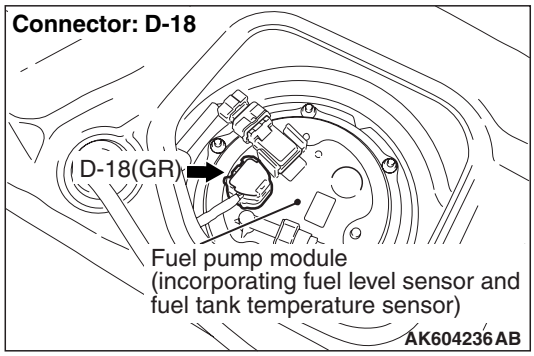


CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

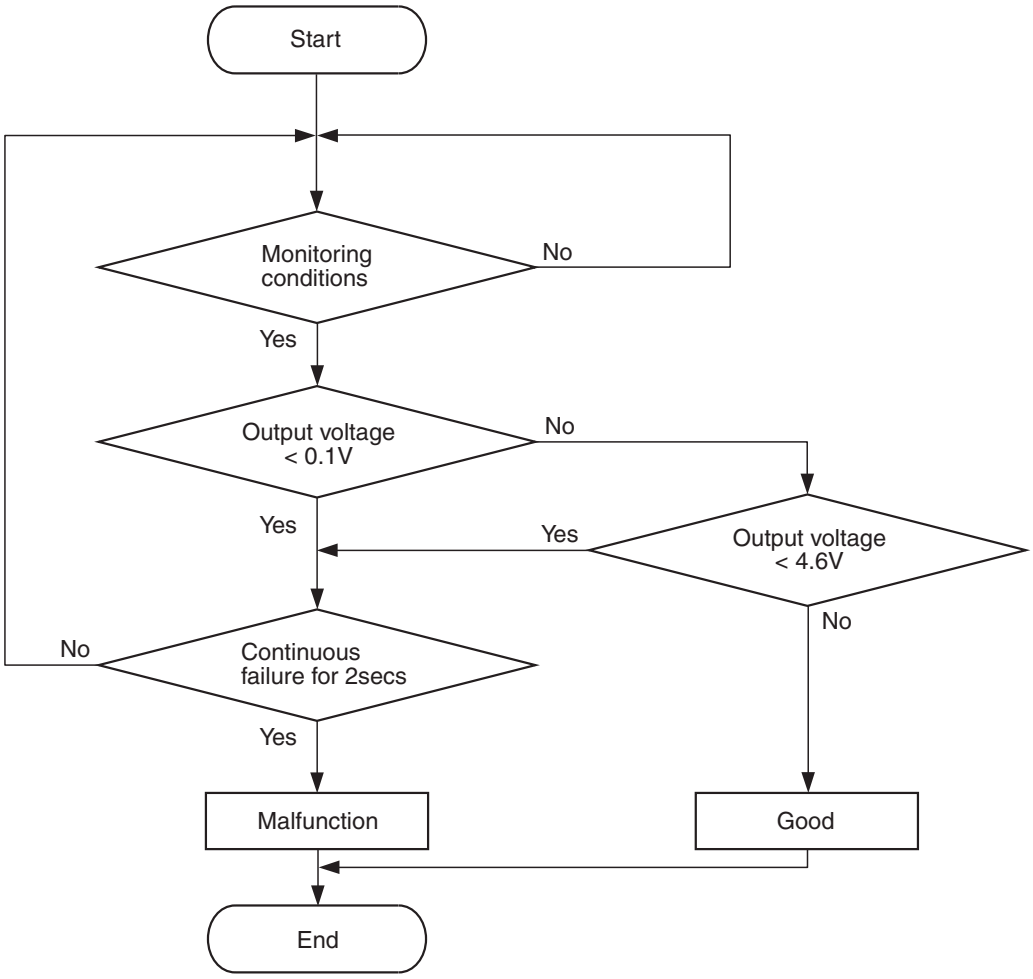
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Sensor output voltage has continued to be 0.1 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Shorted fuel tank temperature sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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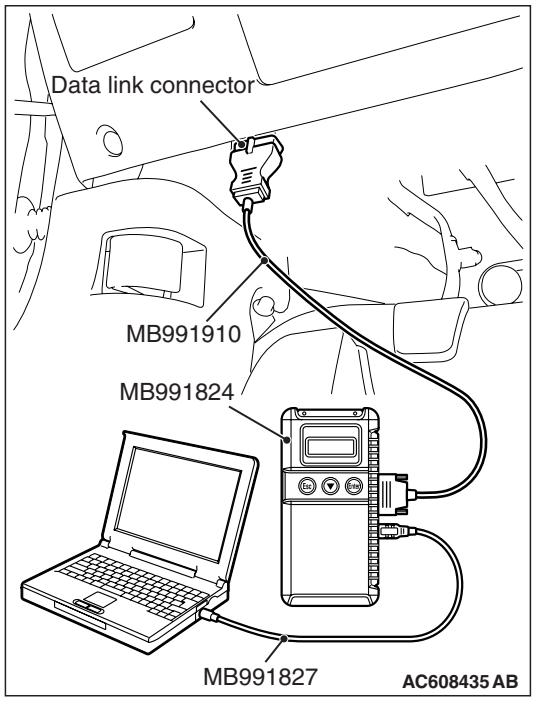
- MB991827: USB Cable
- MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
- Approximately the same as the ambient air temperature when the engine is cooled.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.

STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

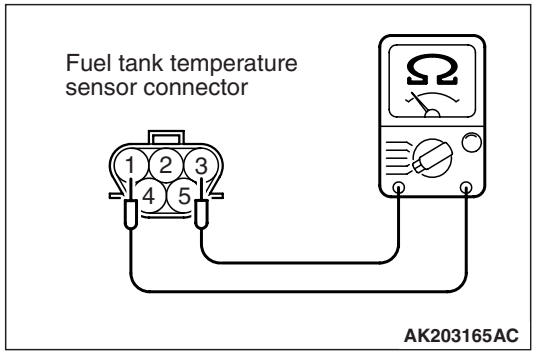
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 3. Check the fuel tank temperature sensor.

(1) Disconnect the fuel tank temperature sensor connector D-18.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 –12.0 kΩ



Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 4.

NO : Replace the fuel tank temperature sensor. Then go to Step 6.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

STEP 5. Check for short circuit to ground between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-39. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 6.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : Repair it. Then go to Step 6.

STEP 6. Test the OBD-II drive cycle.

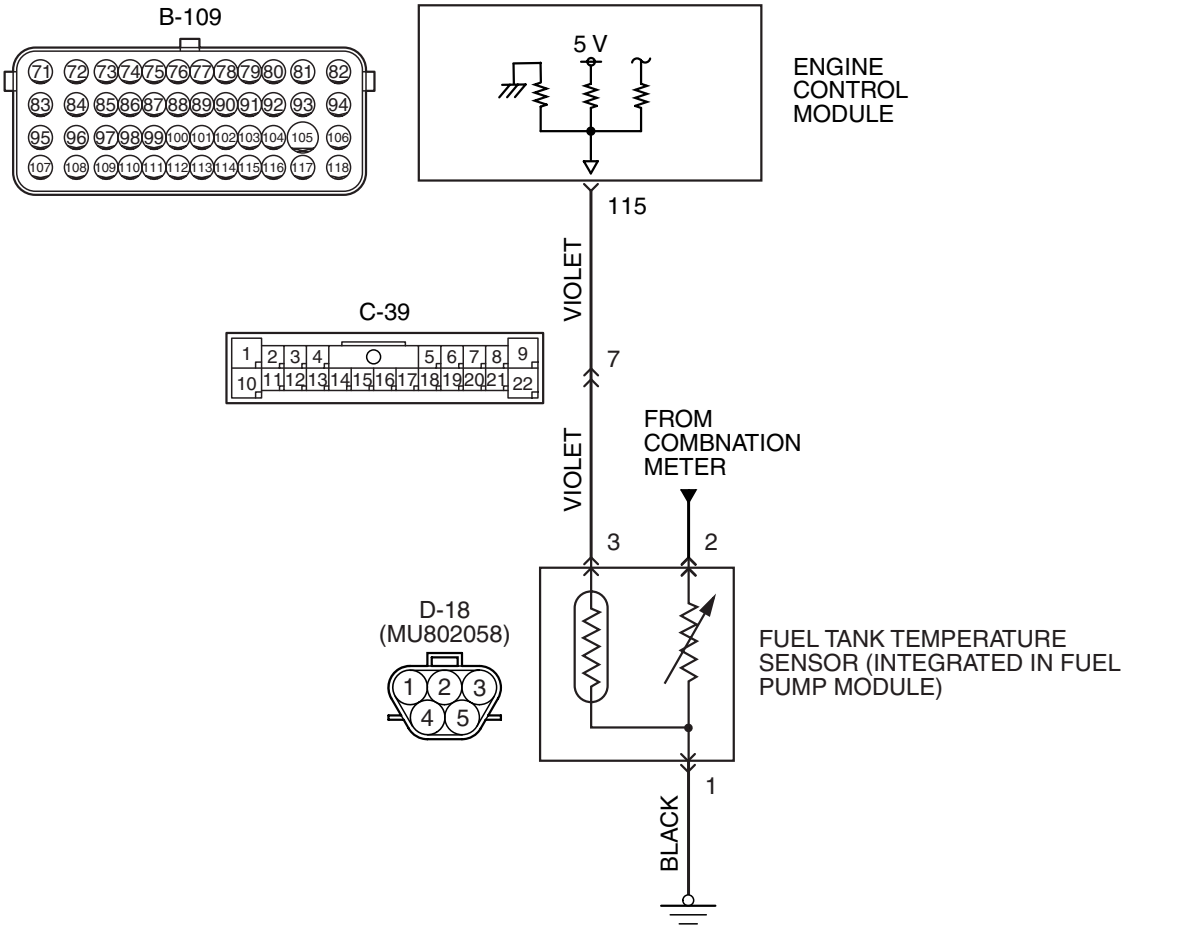
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0182 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0183: Fuel Tank Temperature Sensor Circuit High Input

FUEL TANK TEMPERATURE SENSOR CIRCUIT



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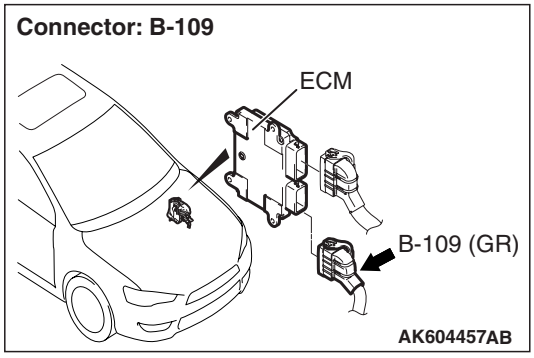

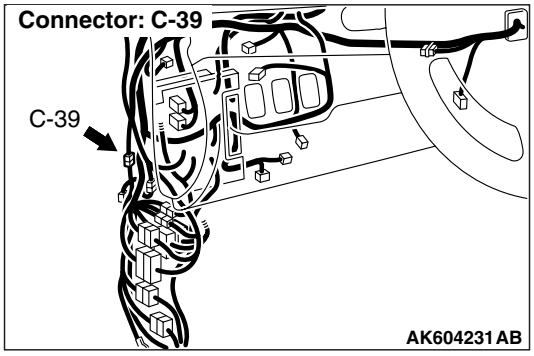

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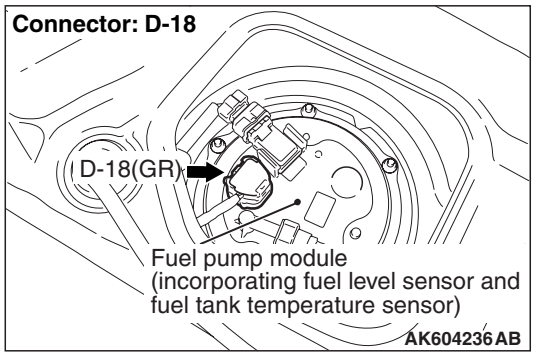


CIRCUIT OPERATION

- 5-volt voltage is applied to the fuel tank temperature sensor output terminal (terminal No. 3) from the ECM (terminal No. 115) via the resistor in the ECM.
- The fuel tank temperature sensor output voltage increases when the resistance increases and decreases when the resistance decreases. The ground terminal (terminal No. 1) is grounded to the vehicle body.

TECHNICAL DESCRIPTION

- The fuel tank temperature sensor converts the fuel tank temperature to a voltage.
- The ECM detects the fuel tank temperature with this output voltage.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank temperature sensor output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

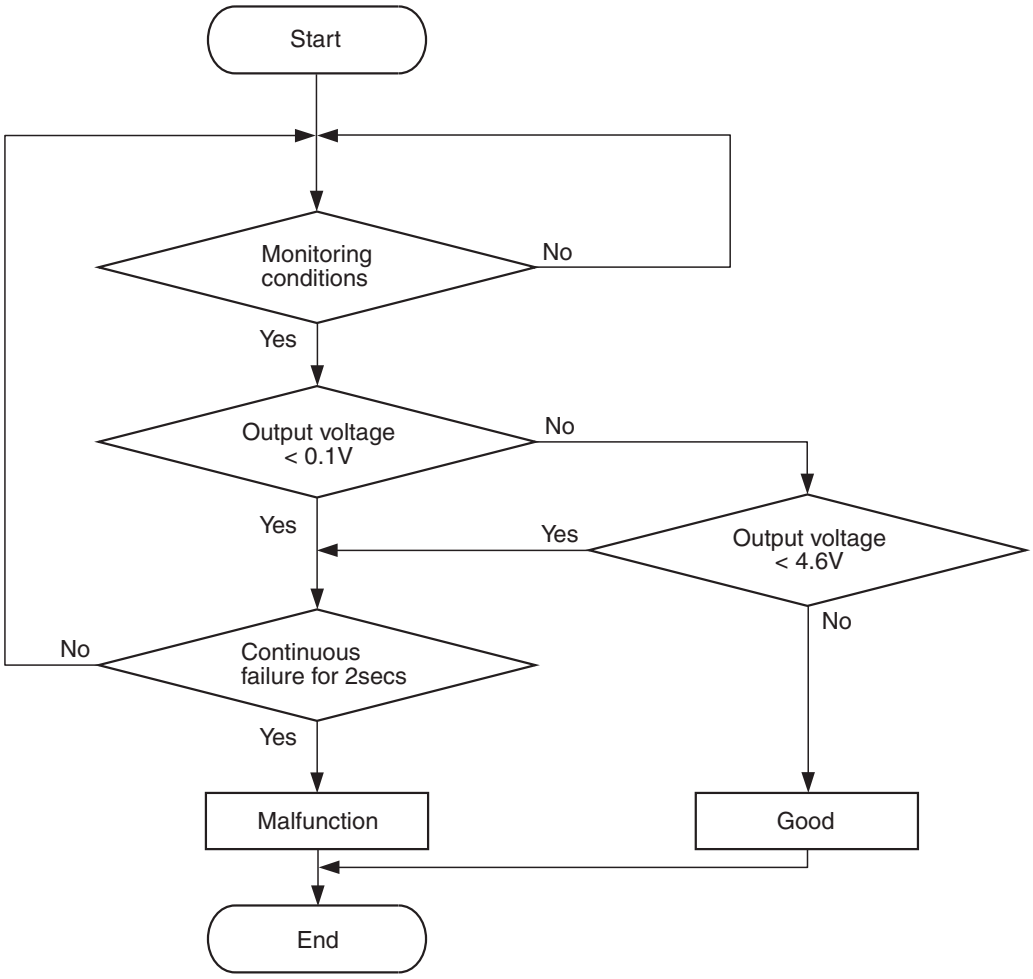
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Sensor output voltage has continued to be 4.6 volts or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel tank temperature sensor failed.
- Open fuel tank temperature sensor circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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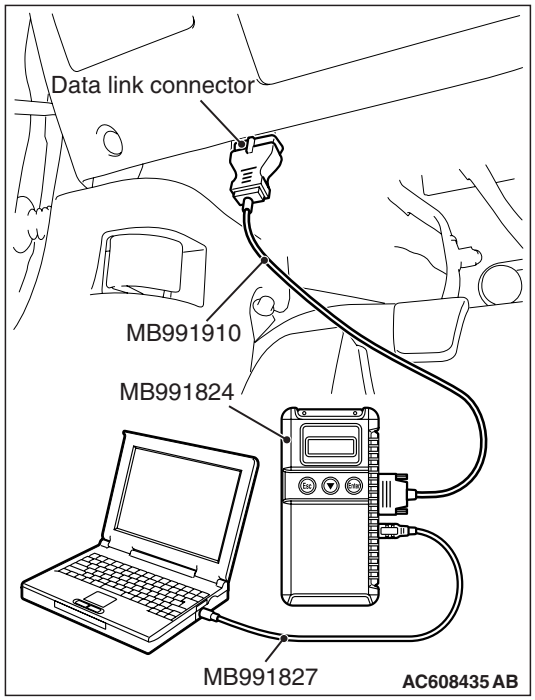
- MB991827: USB Cable
- MB991910: Main Harness A

- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 53: Fuel Tank Temperature Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 53, Fuel Tank Temperature Sensor.
  - Approximately the same as the ambient air temperature when the engine is cooled.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

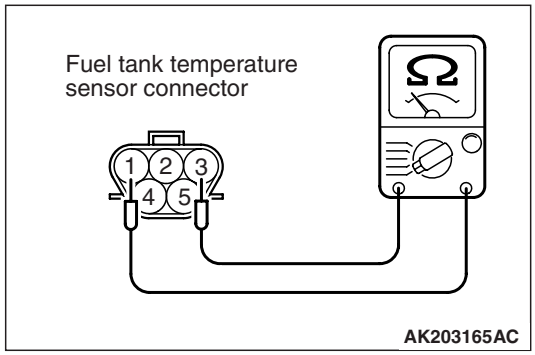
YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector D-18 at the fuel tank temperature sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 3. Check the fuel tank temperature sensor.

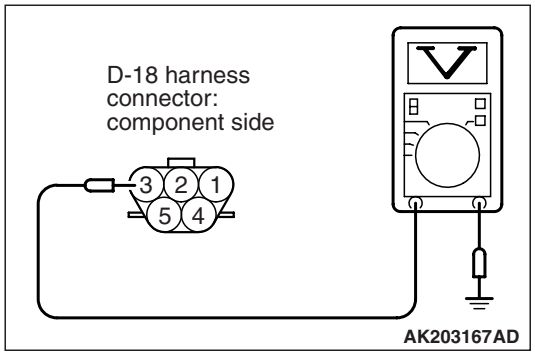


(1) Disconnect the fuel tank temperature sensor connector D-18.
(2) Measure the resistance between terminal No. 1 and No. 3 of the fuel tank temperature sensor.

Standard value:
0.5 –12.0 kΩ

Q: Is the measured resistance between 0.5 and 12.0 kΩ?

YES : Go to Step 4.
NO : Replace the fuel tank temperature sensor. Then go to Step 10.



STEP 4. Check the sensor supply voltage at fuel tank temperature sensor harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.5 and 4.9 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

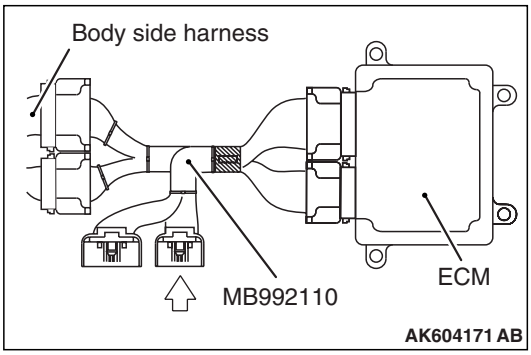
YES : Go to Step 7.
NO : Go to Step 5.

STEP 5. Check harness connector B-109 at ECM for damage.

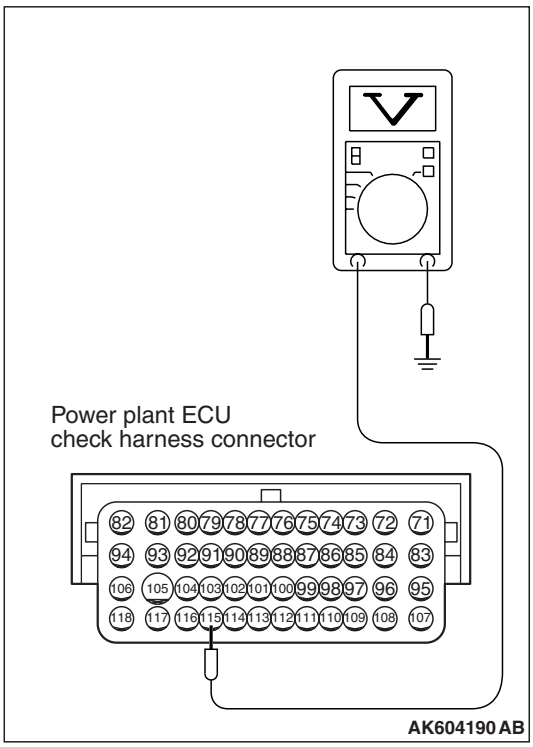
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check the sensor supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the fuel tank temperature sensor connector D-18.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 115 and ground.
- Voltage should be between 4.5 and 4.9 volts.

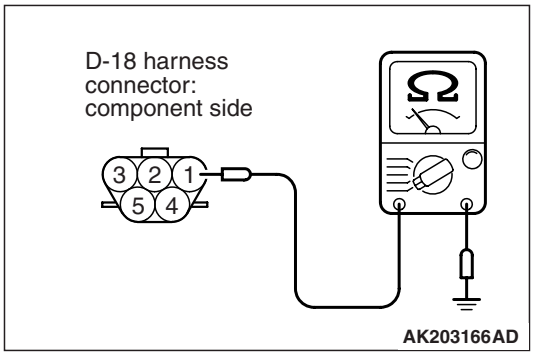
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.5 and 4.9 volts?

YES : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If the intermediate connector is in good condition, repair the harness wire between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115) because of open circuit. Then go to Step 10.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

STEP 7. Check the continuity at fuel tank temperature sensor harness side connector D-18.



(1) Disconnect the connector D-18 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 8.

NO : Repair harness wire between fuel tank temperature sensor connector D-18 (terminal No. 1) and ground because of open circuit or harness damage. Then go to Step 10.

STEP 8. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 9. Check for harness damage between fuel tank temperature sensor connector D-18 (terminal No. 3) and ECM connector B-109 (terminal No. 115).

NOTE: Check harness after checking intermediate connector C-39. If the intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

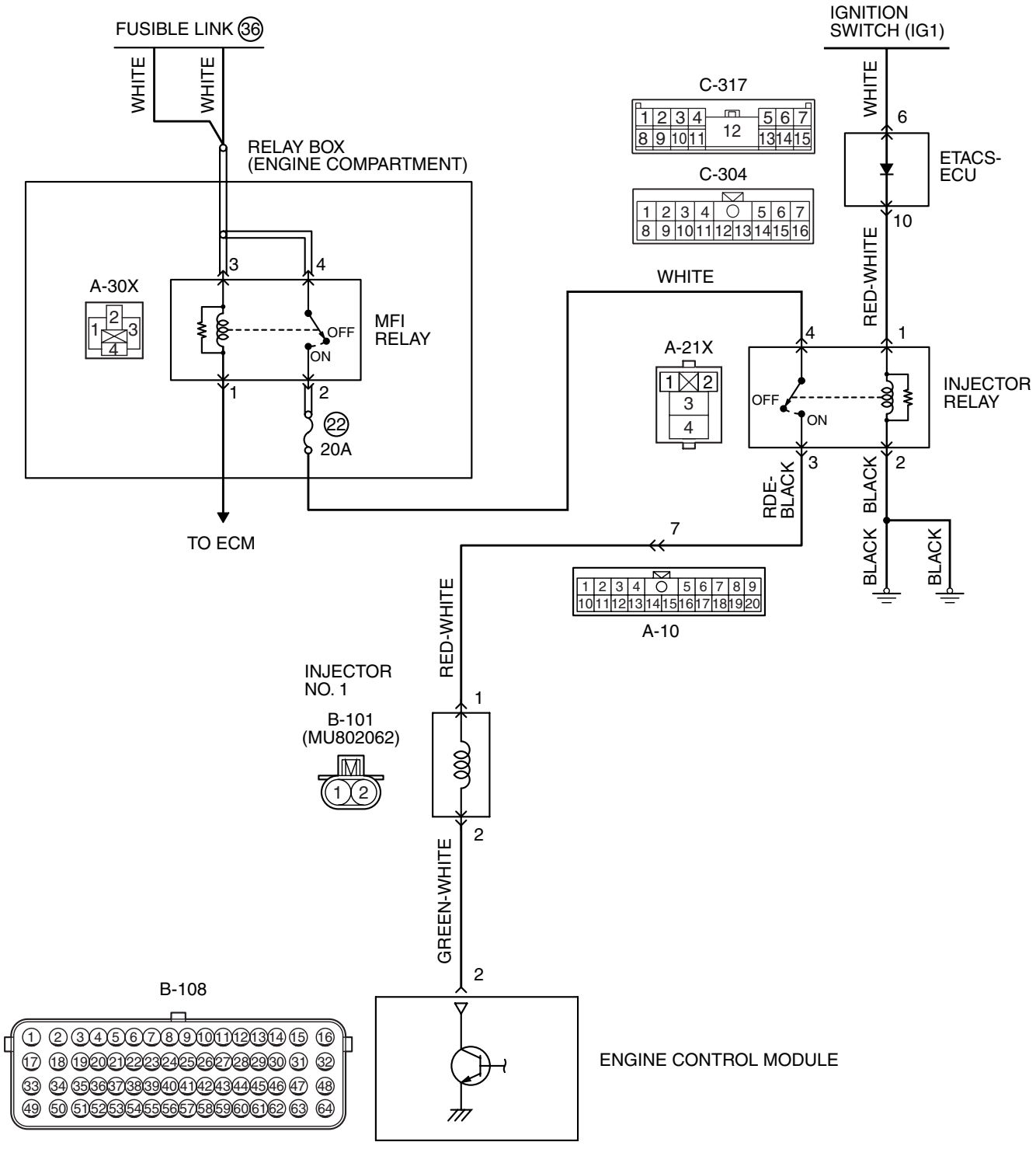
Q: Is DTC P0183 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0201: Injector Circuit-Cylinder 1

INJECTOR CIRCUIT-CYLINDER 1



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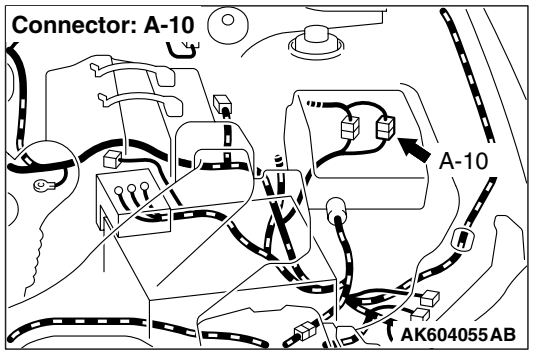
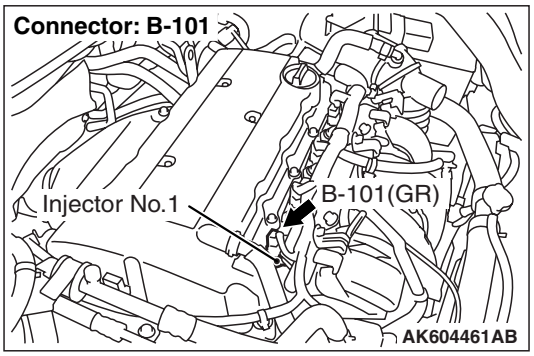
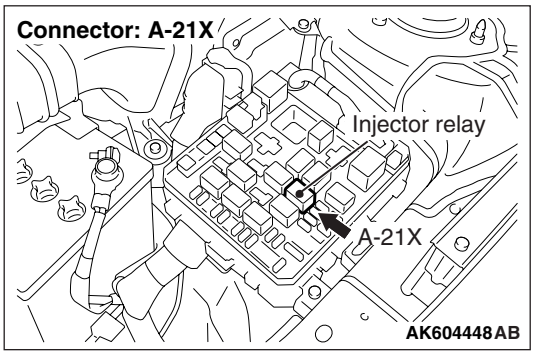
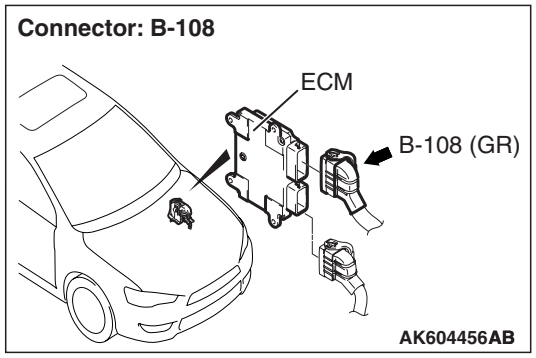
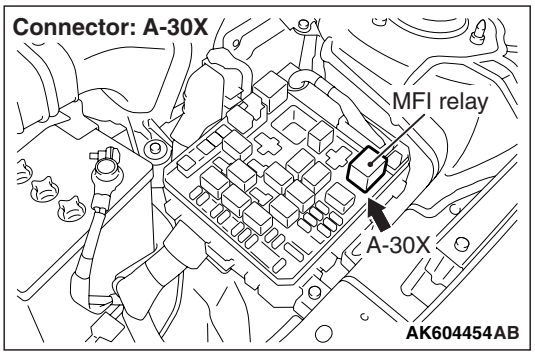
TSB Revision

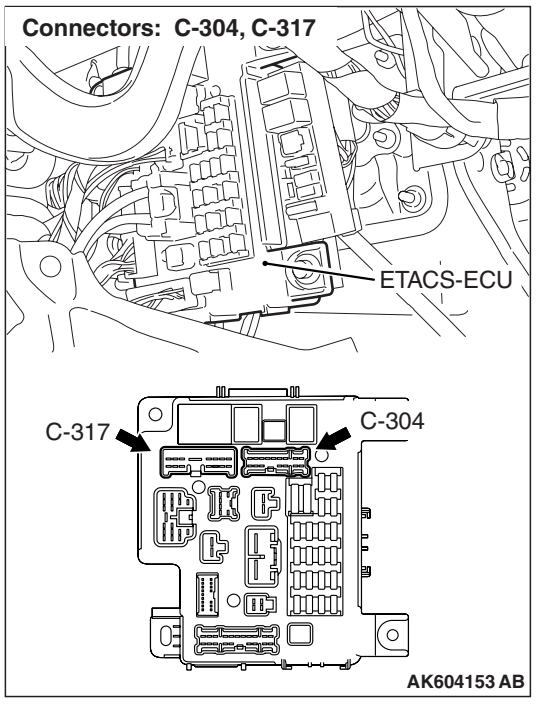












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

TSB Revision

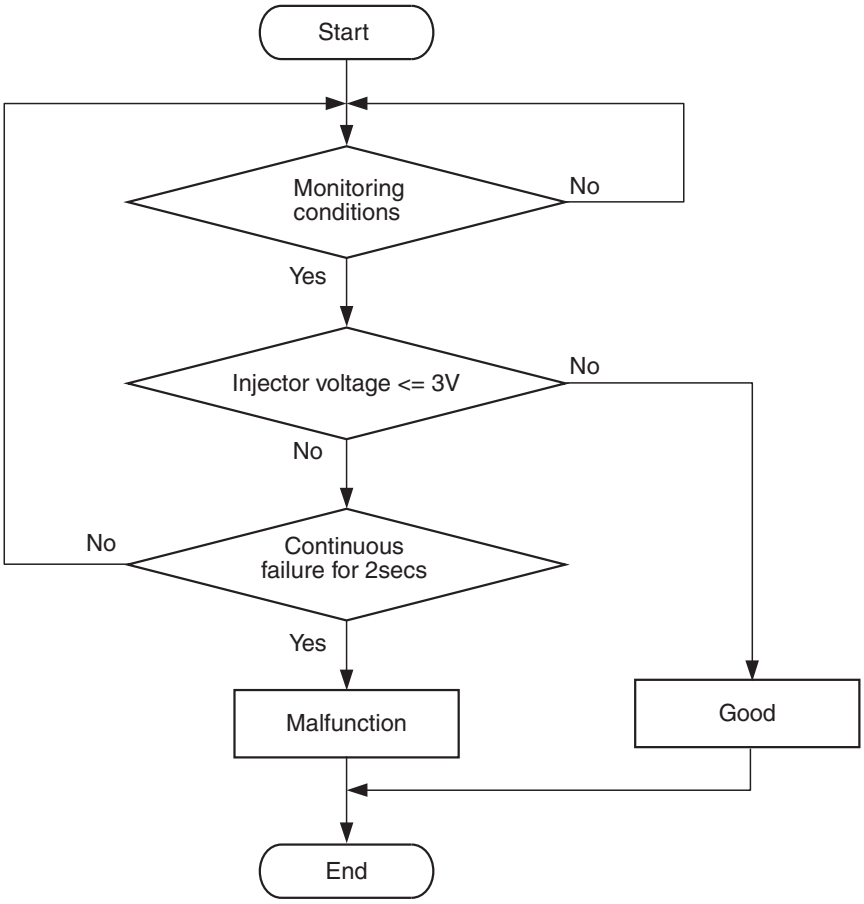
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



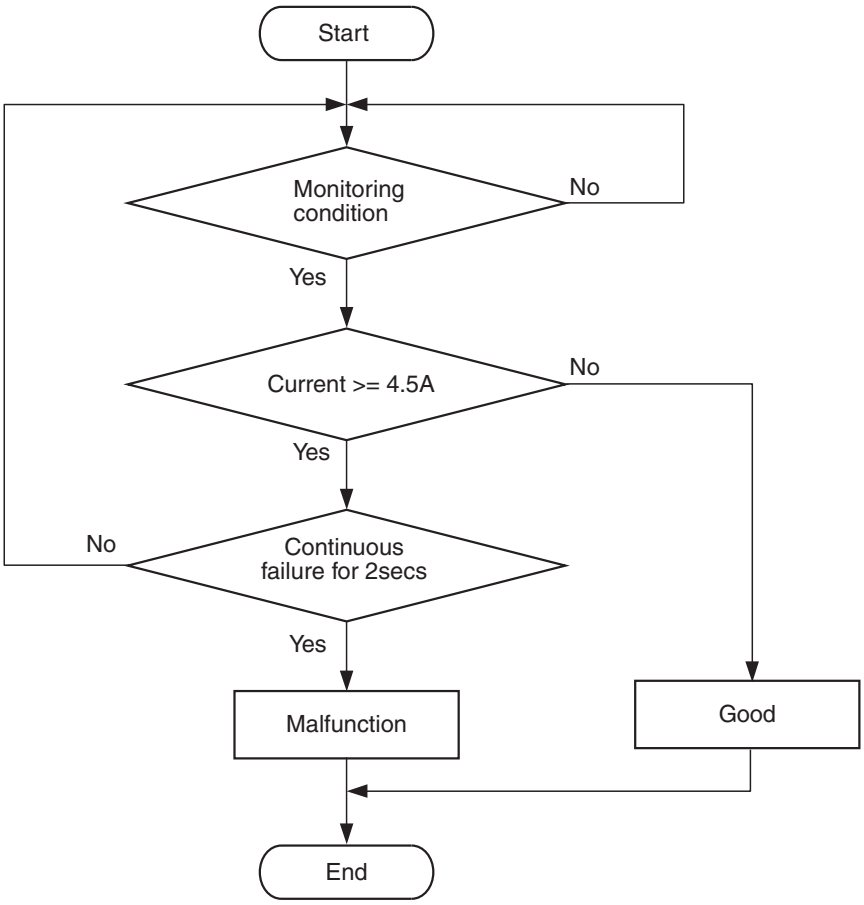
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK604332

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4.5 ampere or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

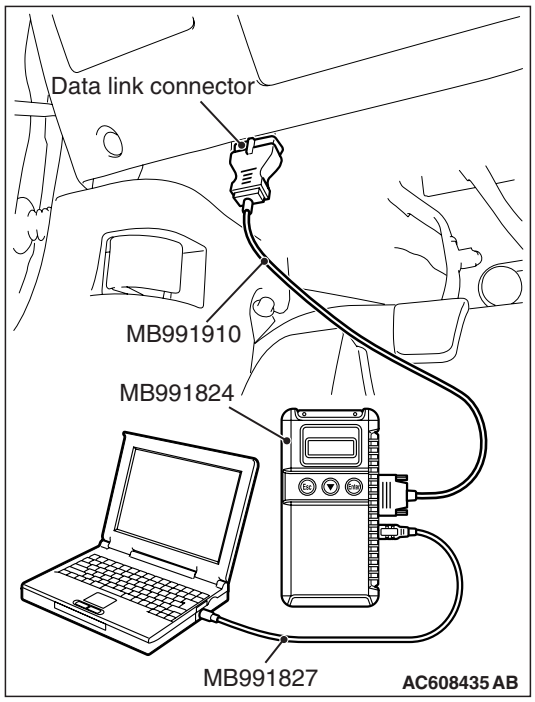
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 1 cylinder injector failed.
- Open or shorted No. 1 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check actuator test item 1: No. 1 Injector.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 1 No. 1 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly rougher.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

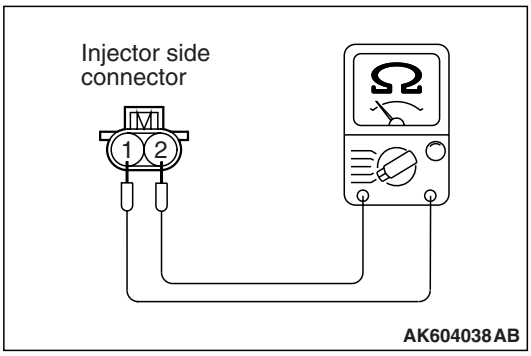
NO : Go to Step 2.

STEP 2. Check harness connector B-101 at No. 1 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 3. Check the No. 1 cylinder injector.

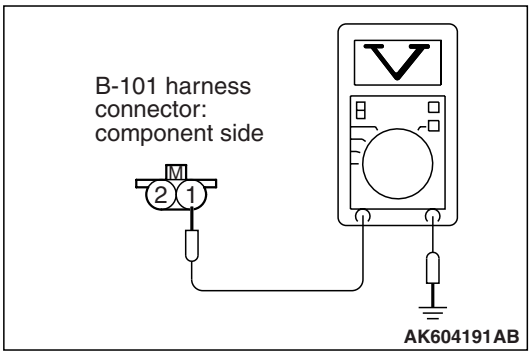
(1) Disconnect the No. 1 cylinder injector connector B-101.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 4.

NO : Replace the No. 1 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 1 cylinder injector connector.

(1) Disconnect connector B-101 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 14.
NO : Go to Step 5.

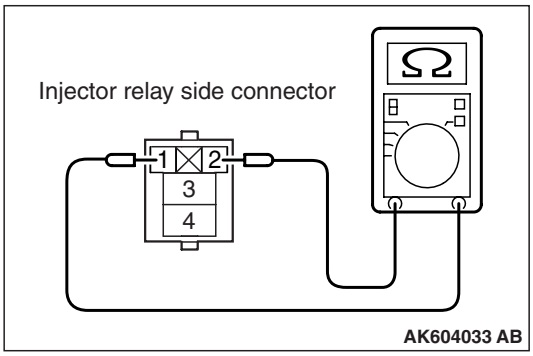
STEP 5. Check harness connector A-21X at injector relay for damage.

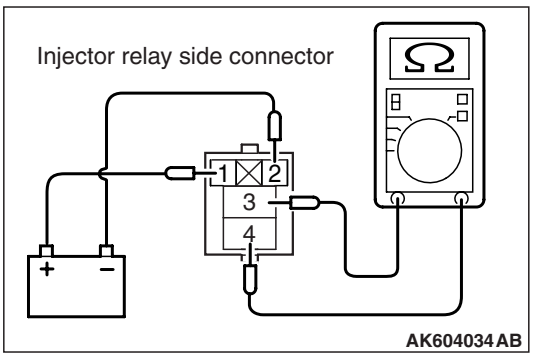
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity. (approximately 70 ohms)





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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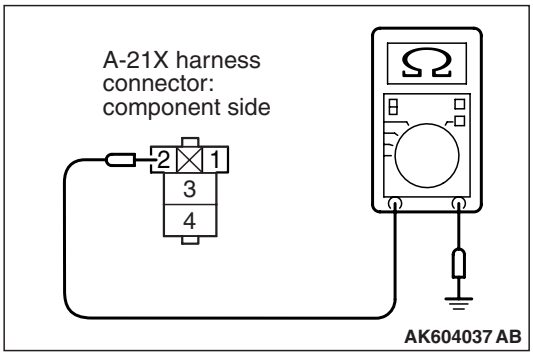
STEP 7. Check for continuity at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

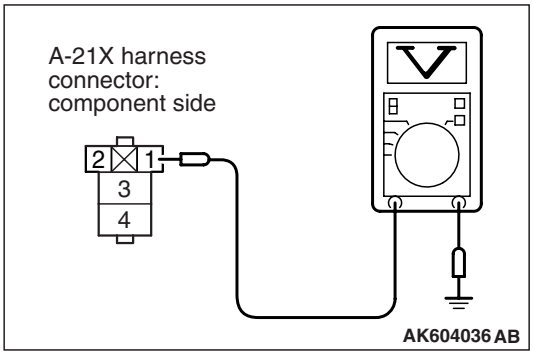


Q: Does continuity exist?

YES : Go to Step 8.
NO : Repair harness wire between injector relay connector A-21X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.

STEP 8. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.



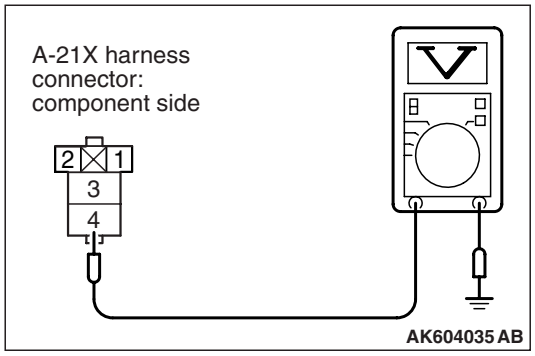
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit or short circuit to ground between injector relay connector A-21X (terminal No. 3) and No. 1 cylinder injector connector B-101 (terminal No. 1).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

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STEP 14. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 15. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-21X (terminal No. 3) and No. 1 cylinder injector connector B-101 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-108 at ECM for damage.

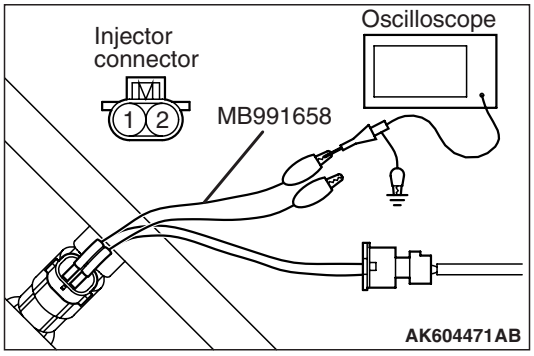
Q: Is the harness connector in good condition?

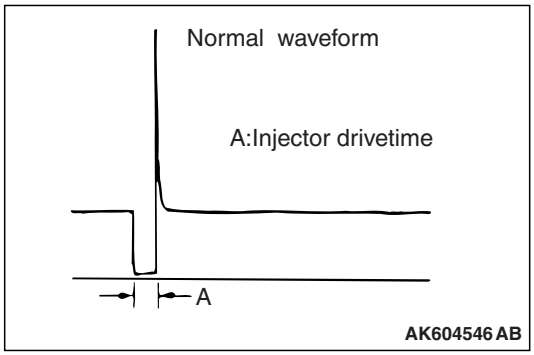
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit and short circuit to ground and harness damage between No. 1 cylinder injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 1 cylinder injector.

(1) Disconnect the No. 1 cylinder injector connector B-101 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 2.

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

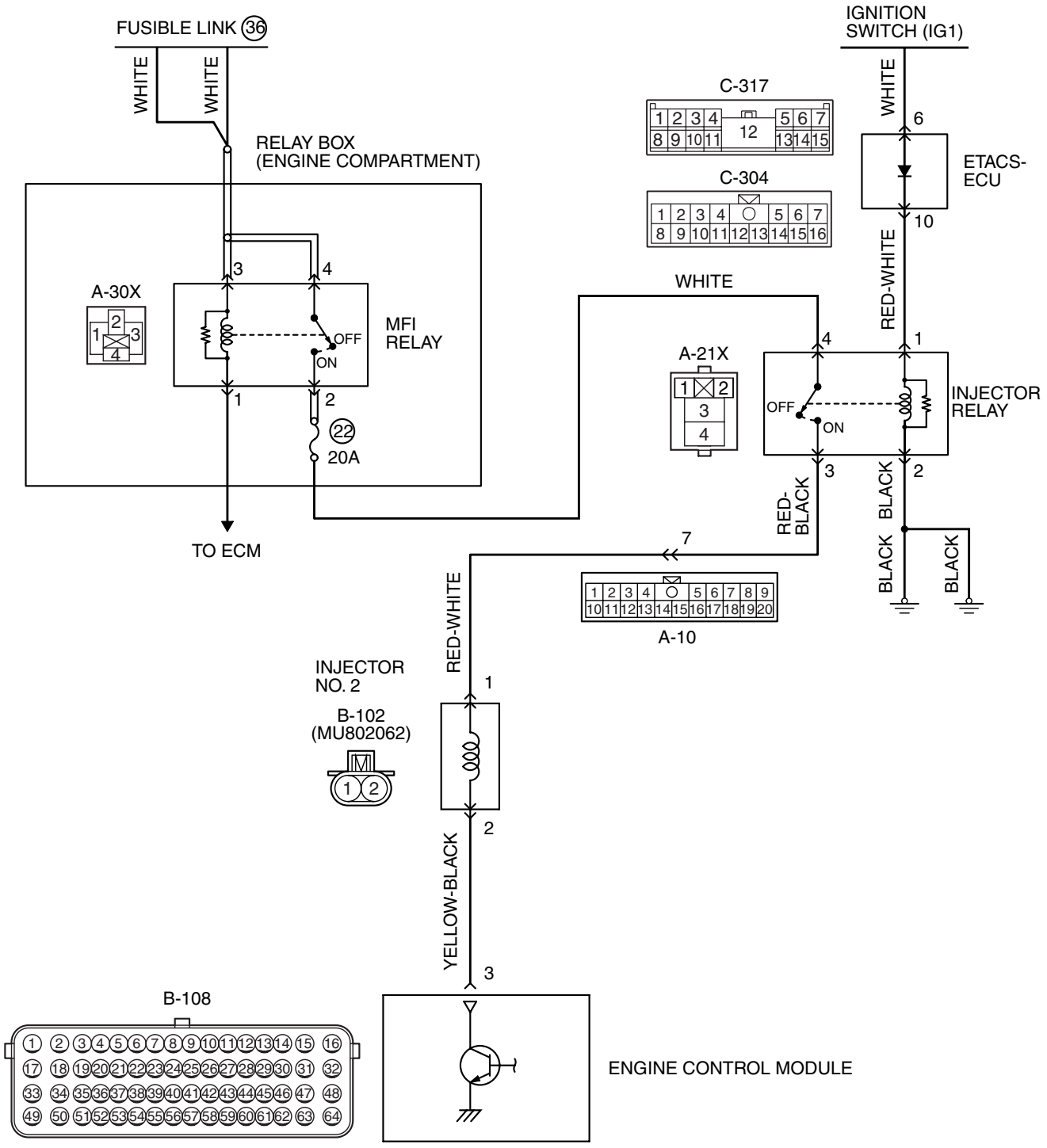
Q: Is DTC P0201 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0202: Injector Circuit-Cylinder 2

INJECTOR CIRCUIT-CYLINDER 2



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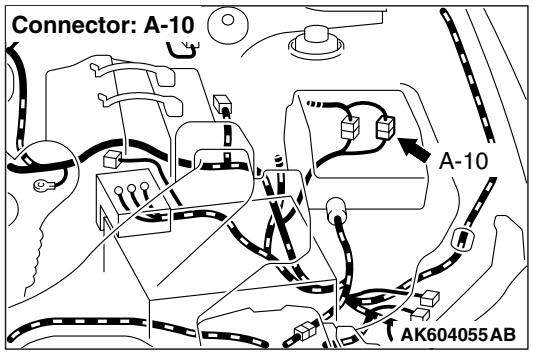
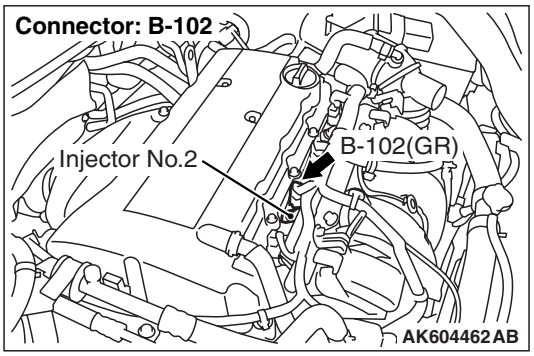
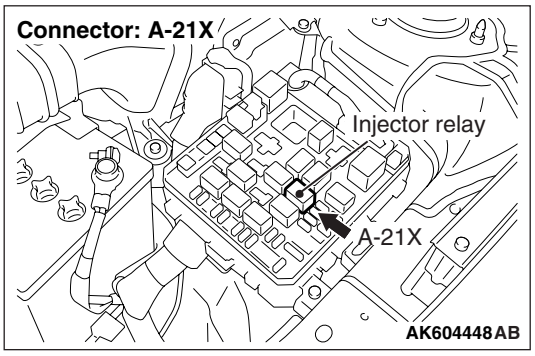
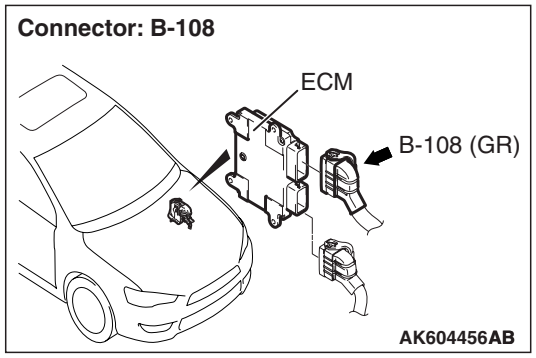
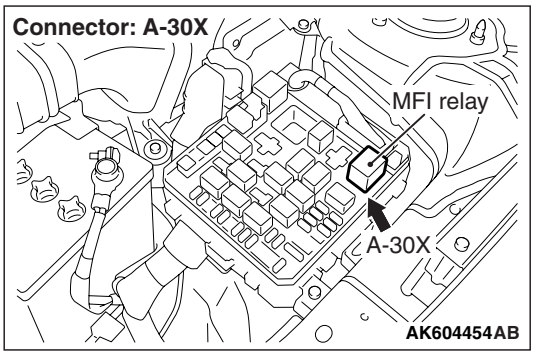
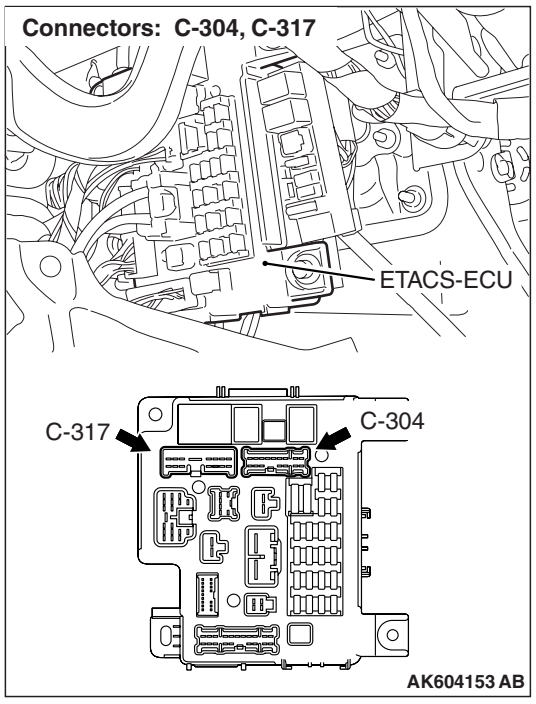












CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

TSB Revision

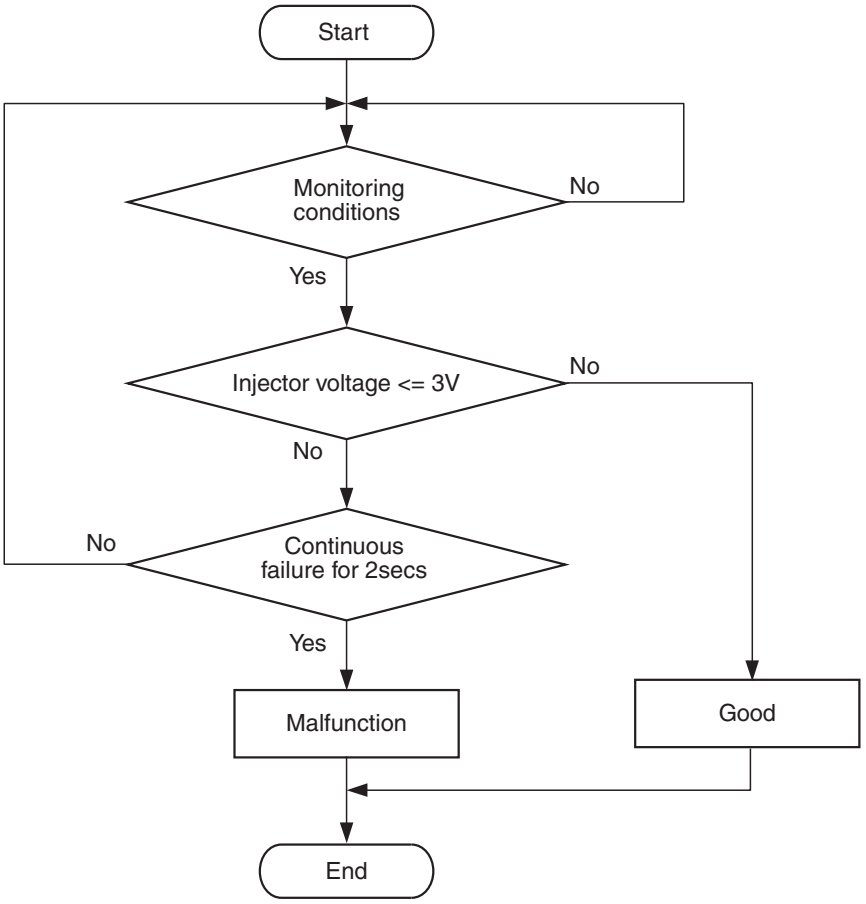
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



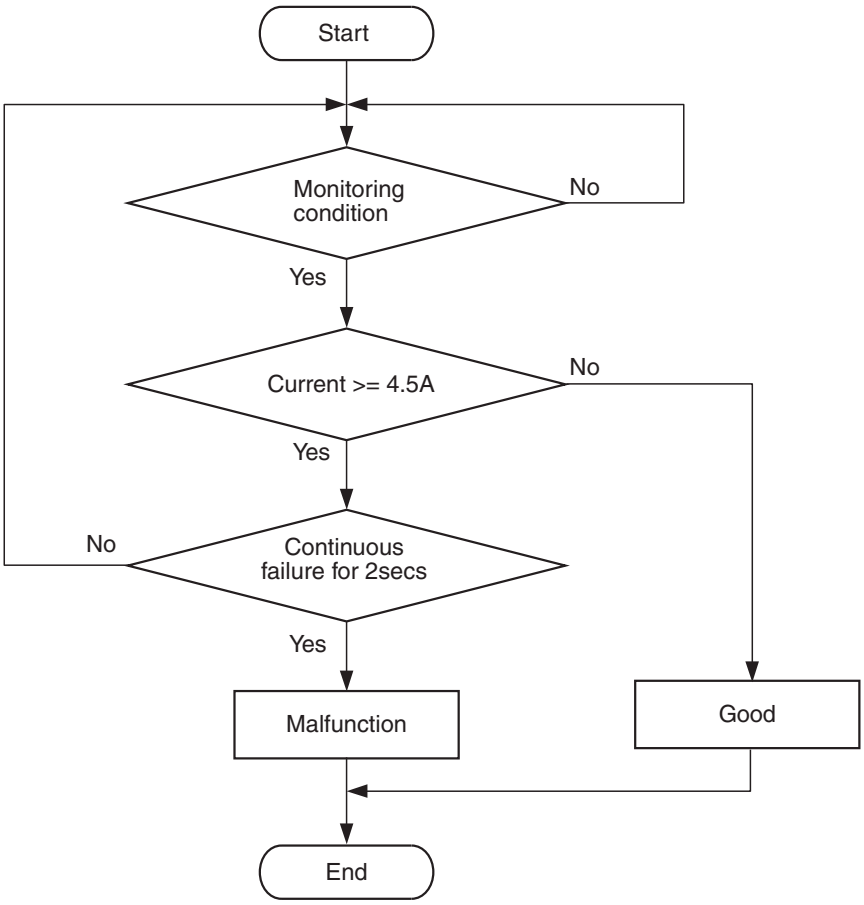
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK604332

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4.5 ampere or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

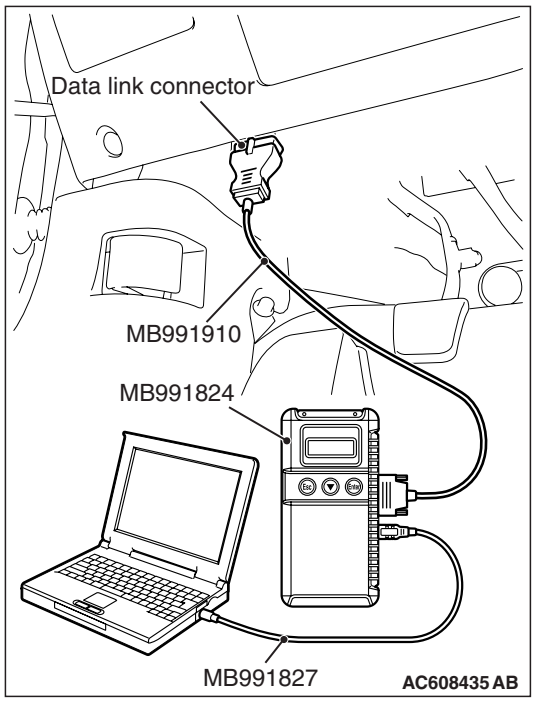
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 2 cylinder injector failed.
- Open or shorted No. 2 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check actuator test item 2: No. 2 Injector.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 2 No. 2 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly rougher.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

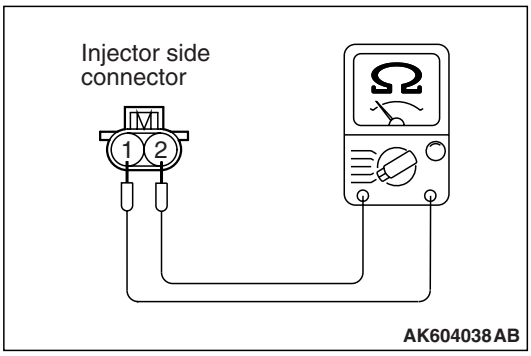
NO : Go to Step 2.

STEP 2. Check harness connector B-102 at No. 2 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 3. Check the No. 2 cylinder injector.

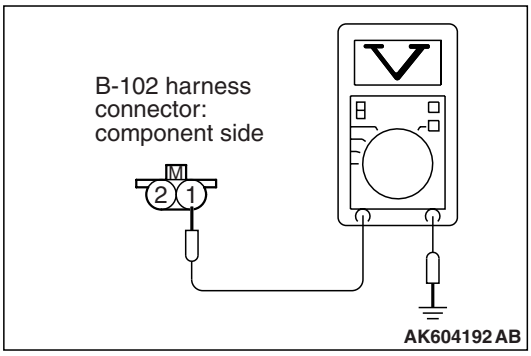
(1) Disconnect the No. 2 cylinder injector connector B-102.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 4.

NO : Replace the No. 2 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 2 cylinder injector connector.

(1) Disconnect connector B-102 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 14.
NO : Go to Step 5.

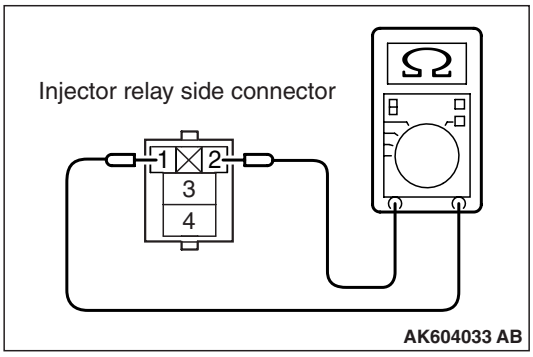
STEP 5. Check harness connector A-21X at injector relay for damage.

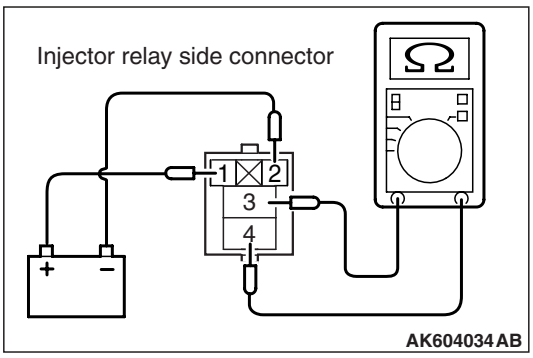
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity. (approximately 70 ohms)





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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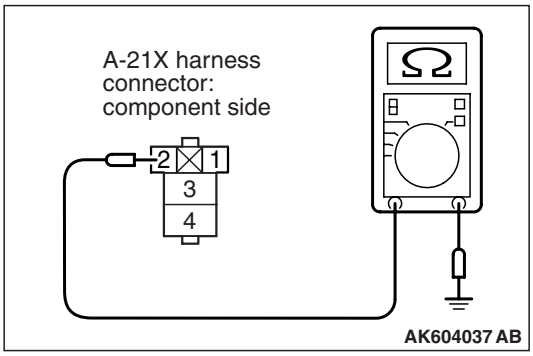
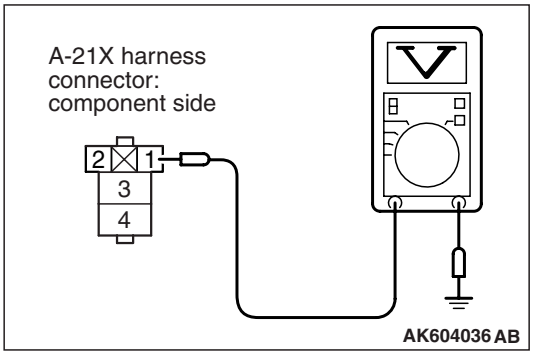


STEP 7. Check for continuity at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 8.
NO : Repair harness wire between injector relay connector A-21X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

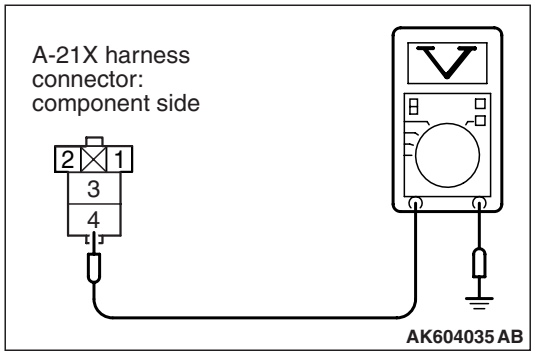
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit or short circuit to ground between injector relay connector A-21X (terminal No. 3) and No. 2 cylinder injector connector B-102 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

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STEP 14. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 15. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-21X (terminal No. 3) and No. 2 cylinder injector connector B-102 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-108 at ECM for damage.

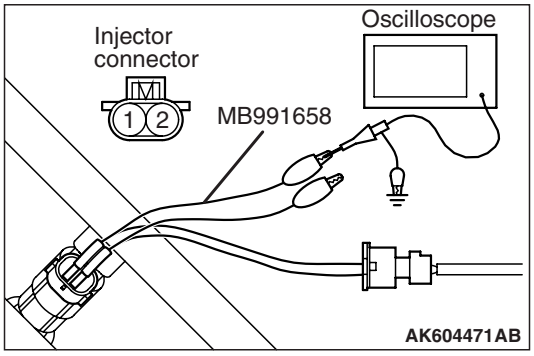
Q: Is the harness connector in good condition?

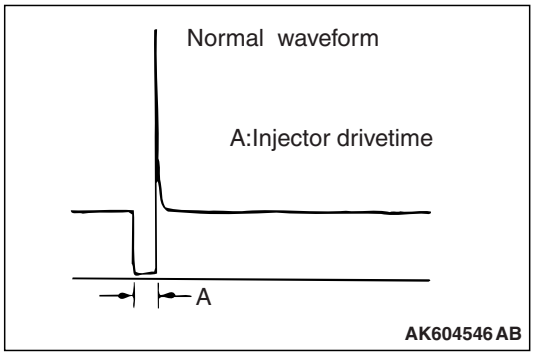
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit and short circuit to ground and harness damage between No. 2 cylinder injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 2 cylinder injector.

(1) Disconnect the No. 2 cylinder injector connector B-102 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 3.

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

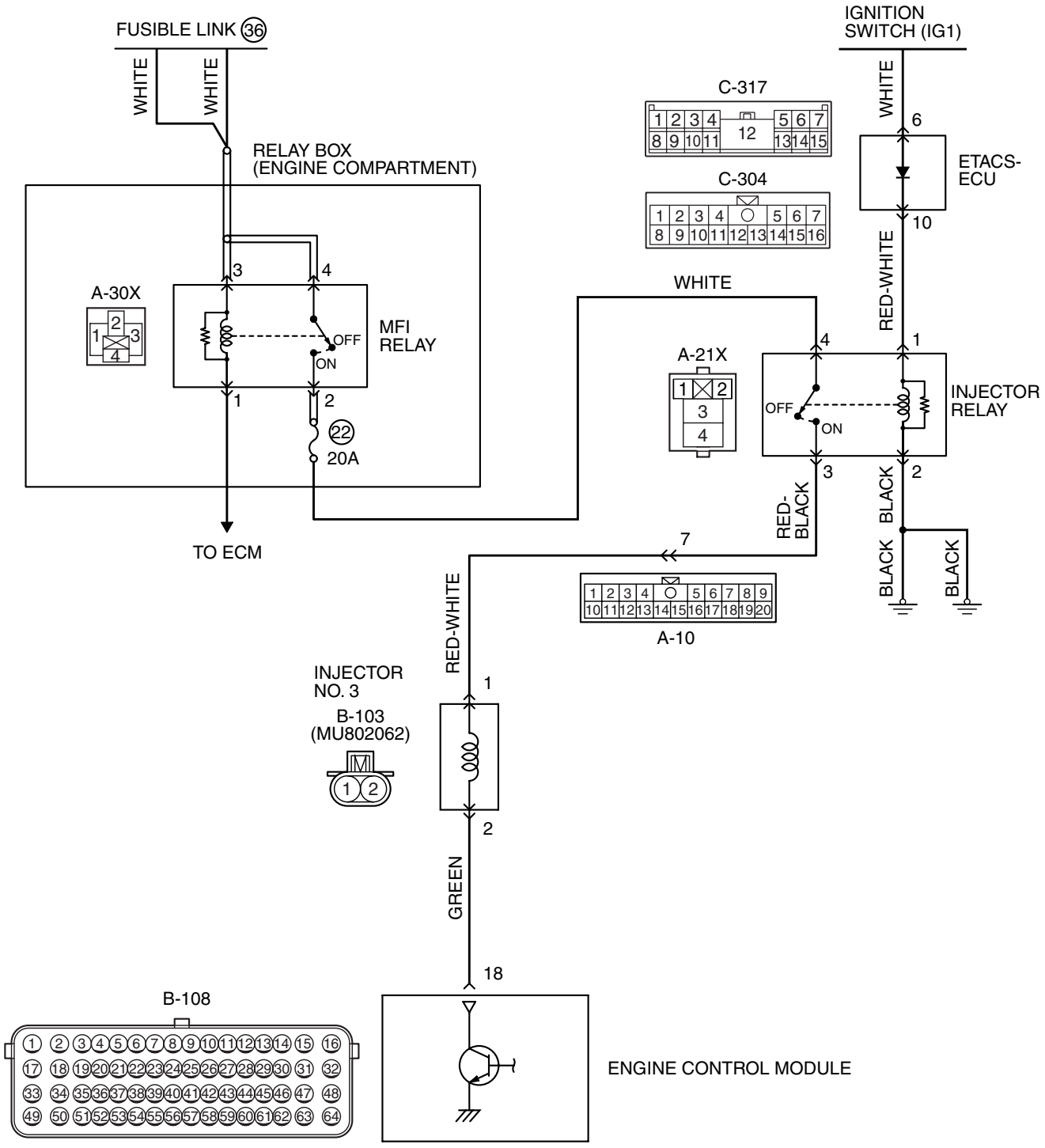
Q: Is DTC P0202 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0203: Injector Circuit-Cylinder 3

INJECTOR CIRCUIT-CYLINDER 3



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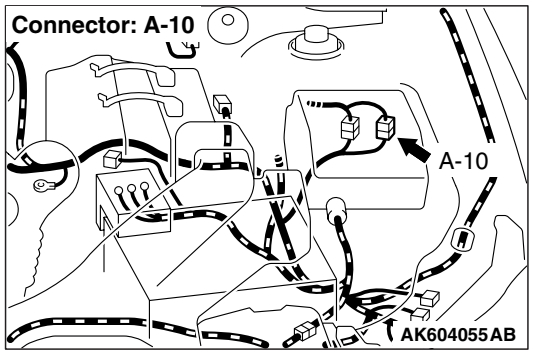

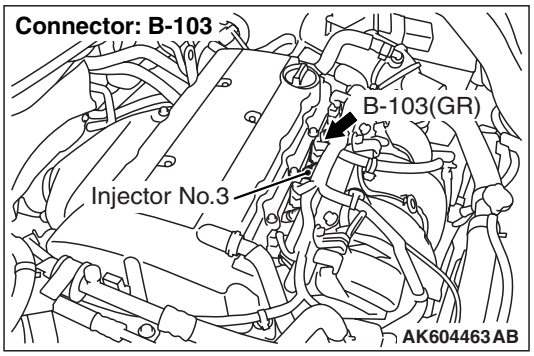

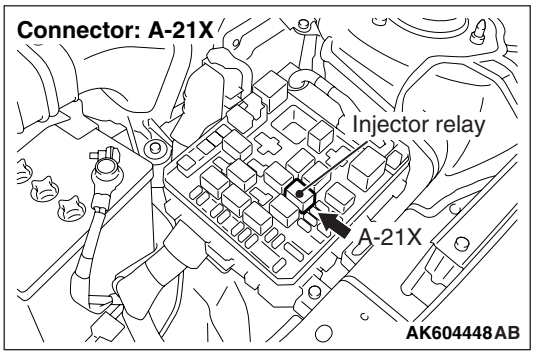

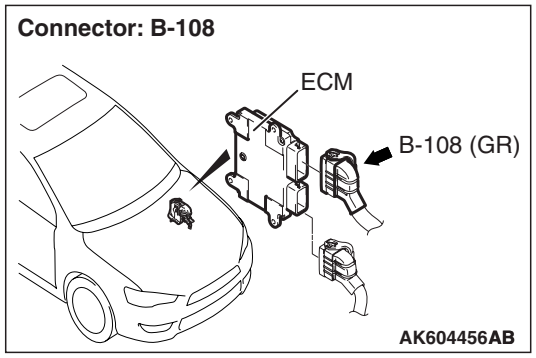

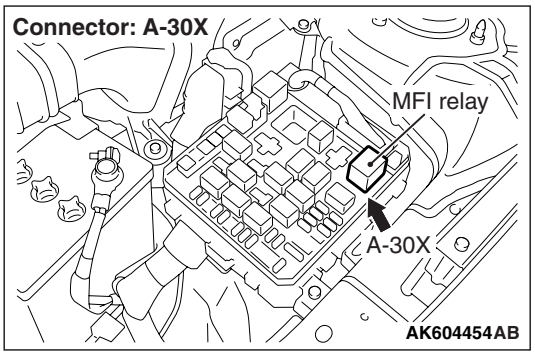

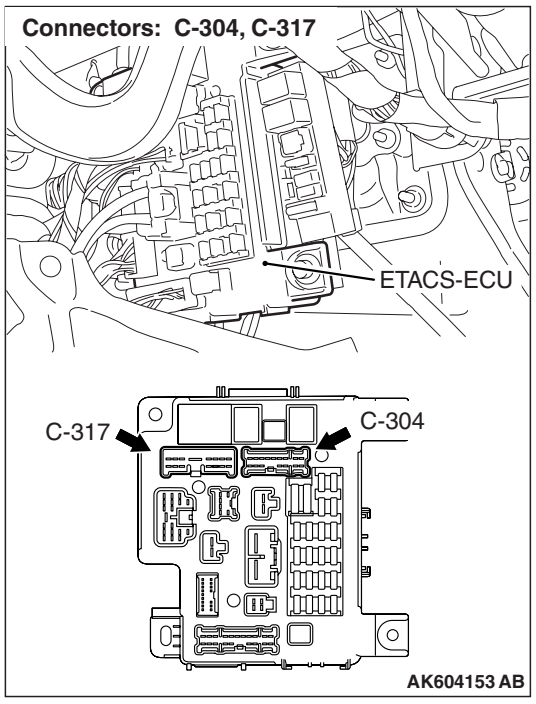

CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

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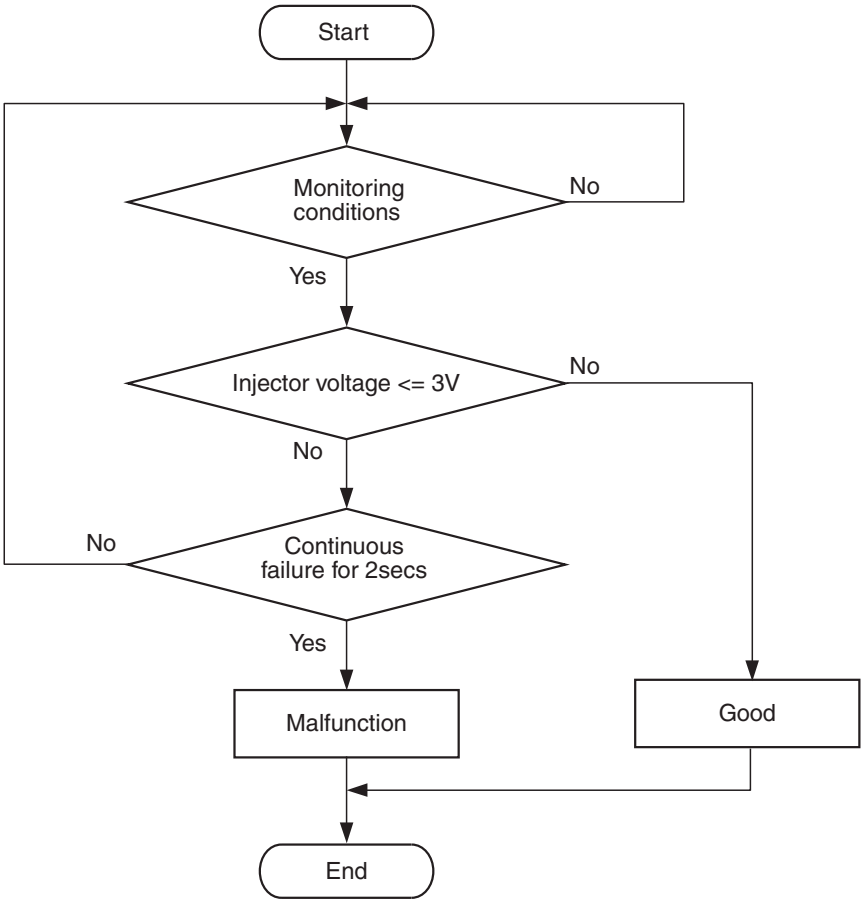
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



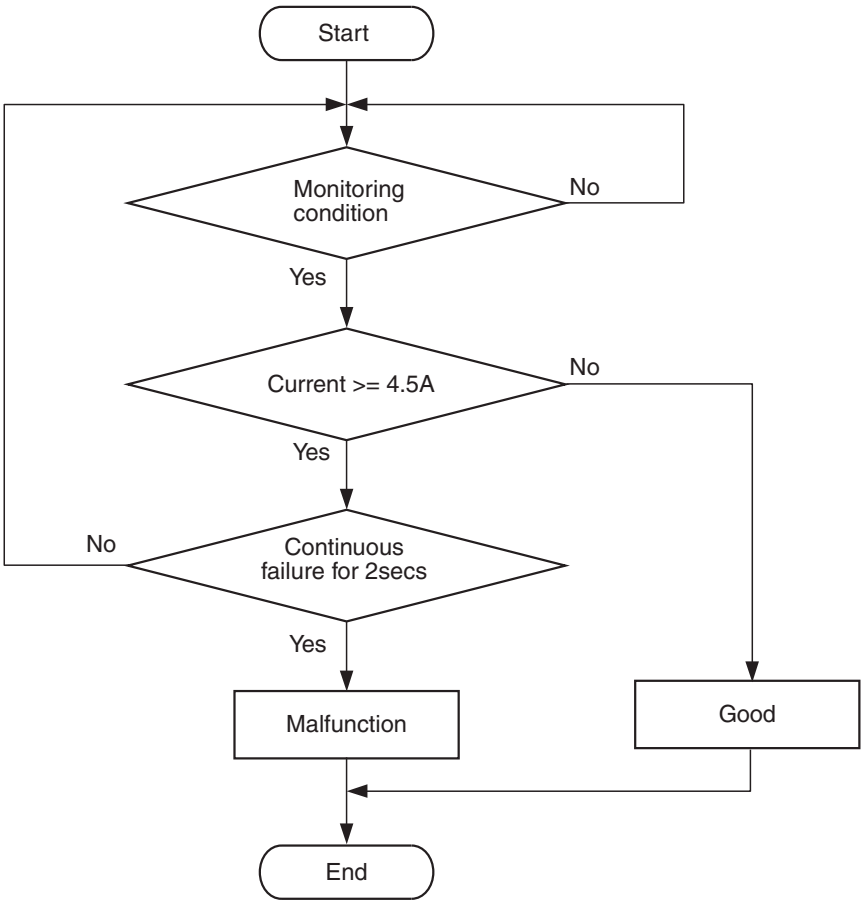
AK604331

Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK604332

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4.5 ampere or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

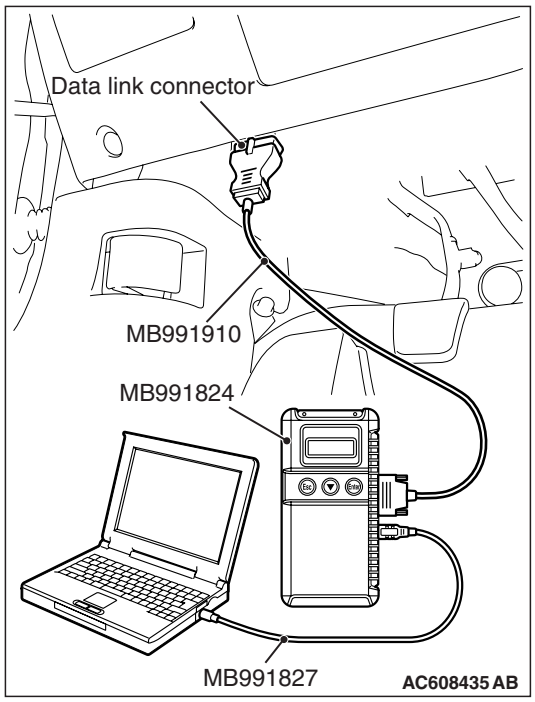
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 3 cylinder injector failed.
- Open or shorted No. 3 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check actuator test item 3: No. 3 Injector.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 3 No. 3 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly rougher.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.

STEP 2. Check harness connector B-103 at No. 3 cylinder injector for damage.

Q: Is the harness connector in good condition?

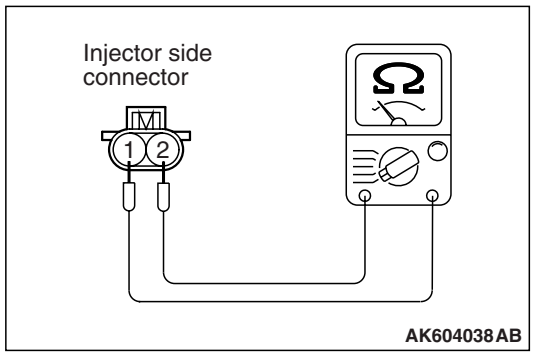
YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 3. Check the No. 3 cylinder injector.

(1) Disconnect the No. 3 cylinder injector connector B-103.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

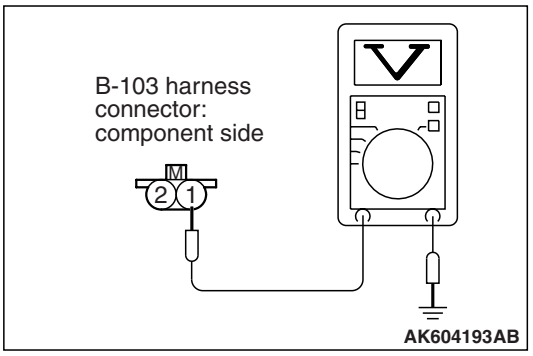
Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 4.

NO : Replace the No. 3 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 3 cylinder injector connector.

(1) Disconnect connector B-103 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 14.
NO : Go to Step 5.

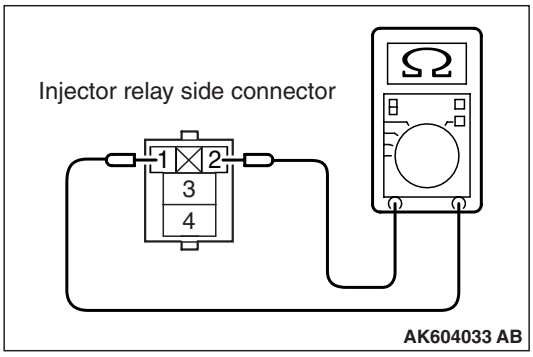
STEP 5. Check harness connector A-21X at injector relay for damage.

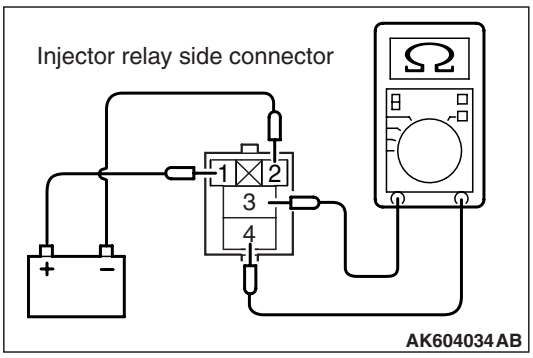
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity. (approximately 70 ohms)





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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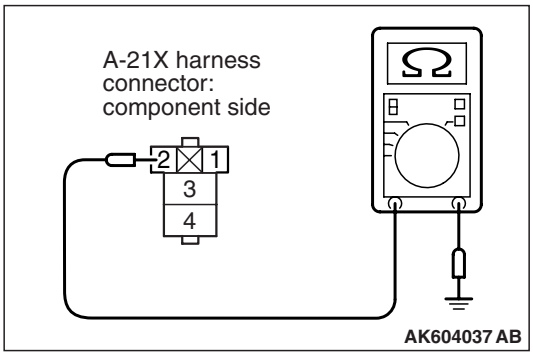
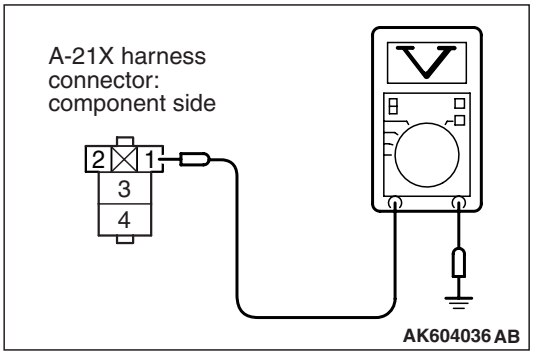


STEP 7. Check for continuity at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 8.
NO : Repair harness wire between injector relay connector A-21X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

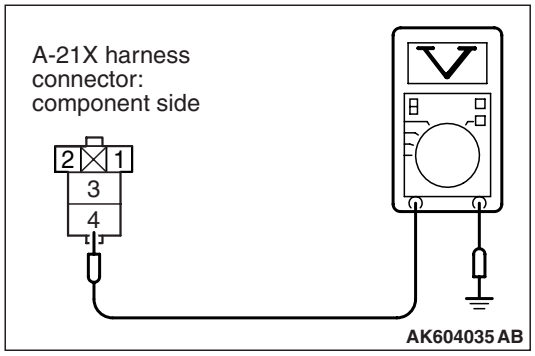
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit or short circuit to ground between injector relay connector A-21X (terminal No. 3) and No. 3 cylinder injector connector B-103 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

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STEP 14. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 15. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-21X (terminal No. 3) and No. 3 cylinder injector connector B-103 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-108 at ECM for damage.

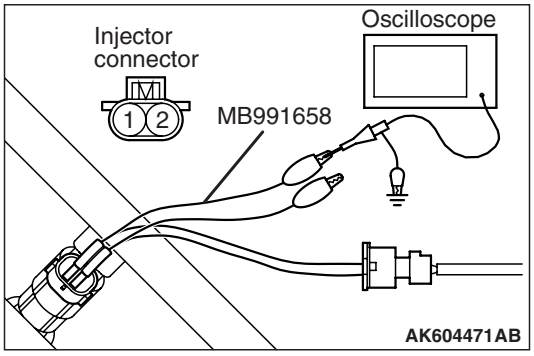
Q: Is the harness connector in good condition?

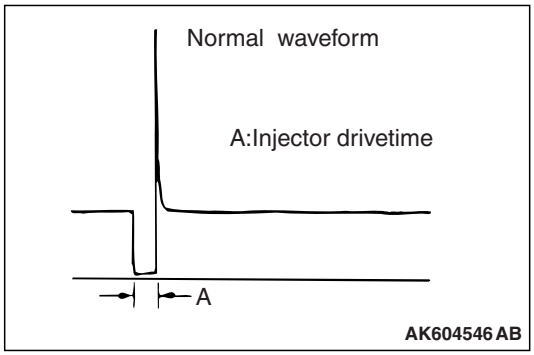
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit and short circuit to ground and harness damage between No. 3 cylinder injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 3 cylinder injector.

(1) Disconnect the No. 3 cylinder injector connector B-103 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 18.

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

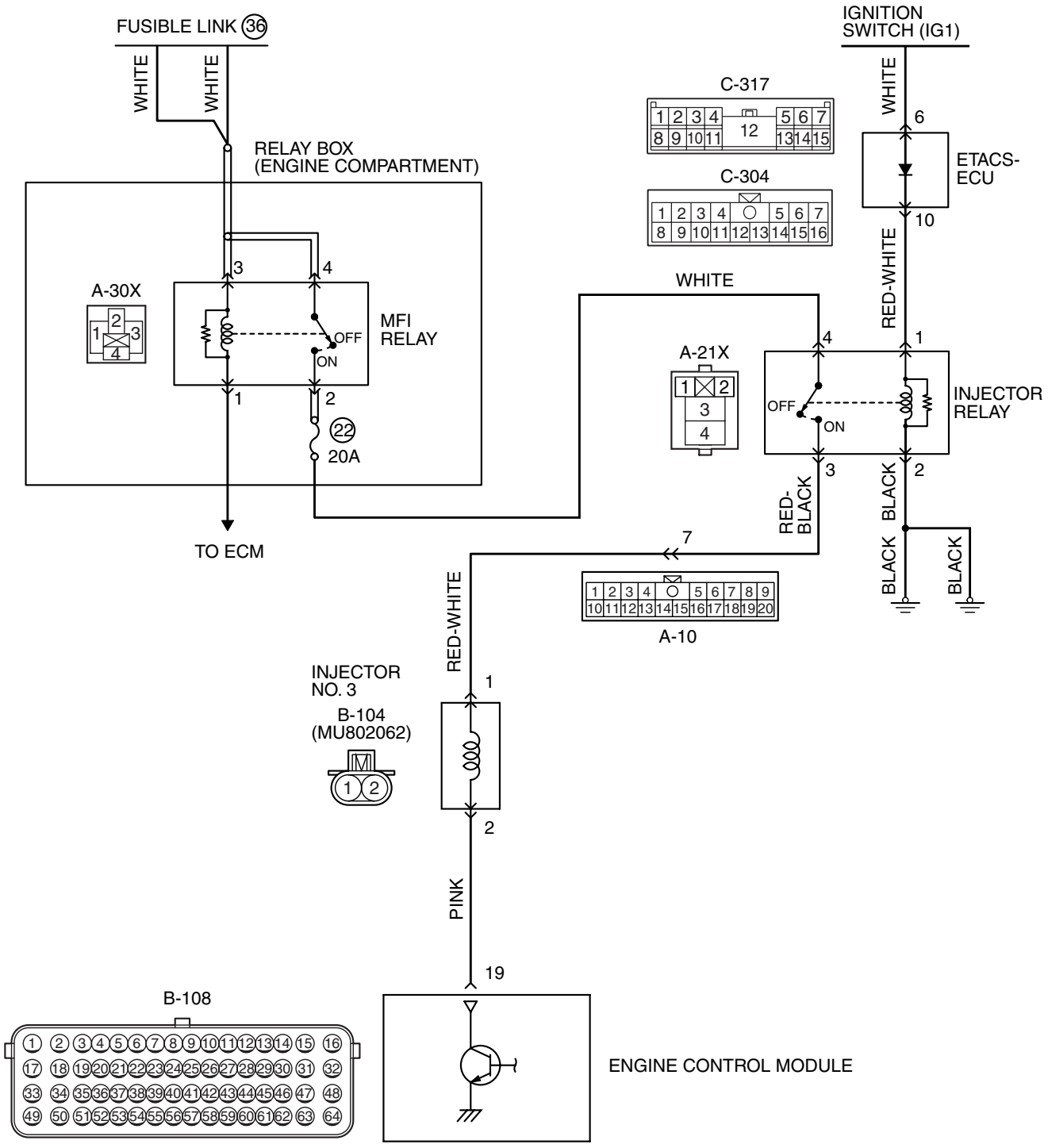
Q: Is DTC P0203 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0204: Injector Circuit-Cylinder 4

INJECTOR CIRCUIT-CYLINDER 4



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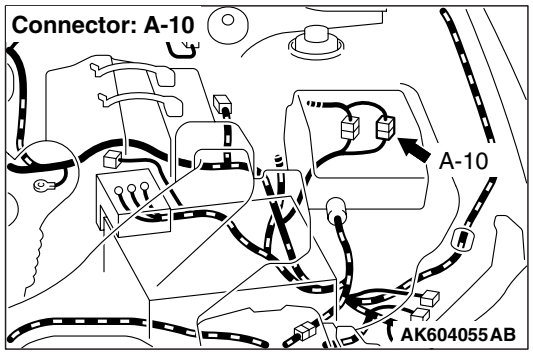

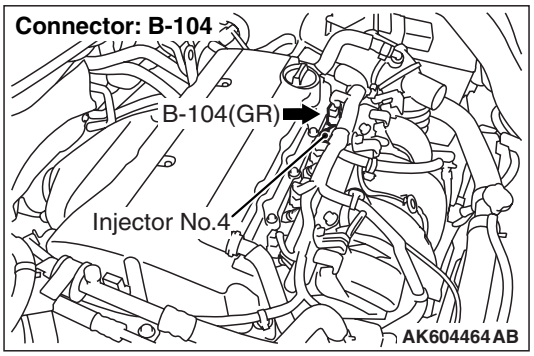

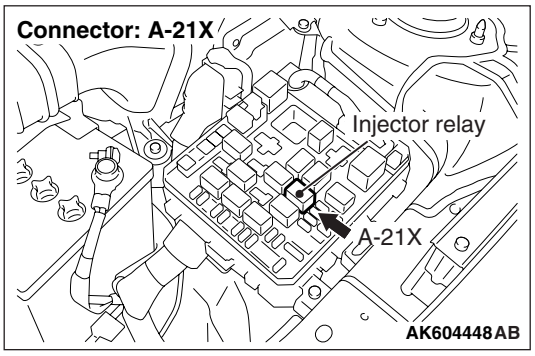

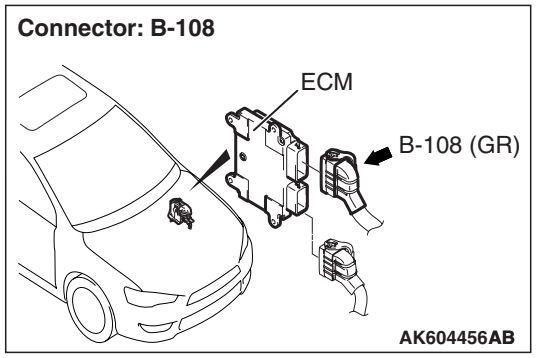

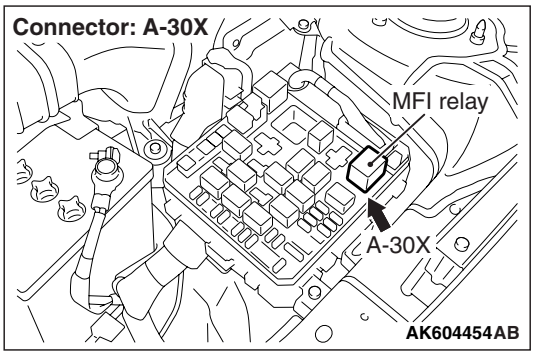

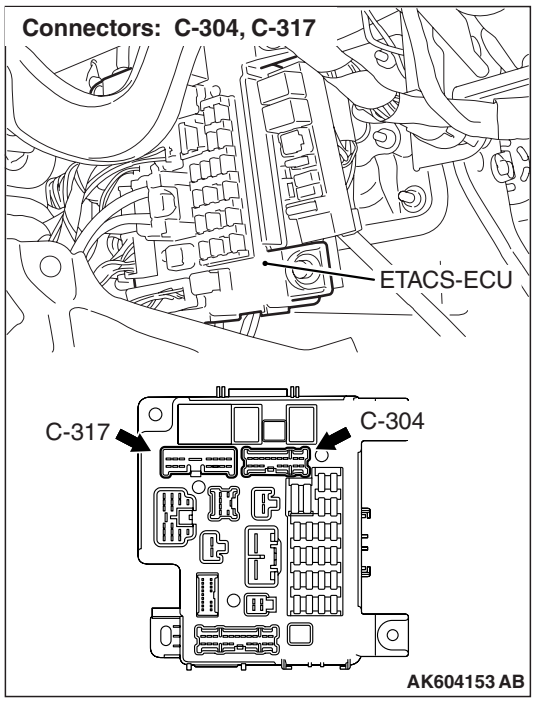

CIRCUIT OPERATION

- The injector power is supplied from the injector relay (terminal No. 3).
- The ECM controls the injector by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The amount of fuel injected by the injector is controlled by the amount of continuity time the coil is grounded by the ECM.

DESCRIPTIONS OF MONITOR METHODS

The ECM detects open circuit and short malfunction.

MONITOR EXECUTION

Continuous

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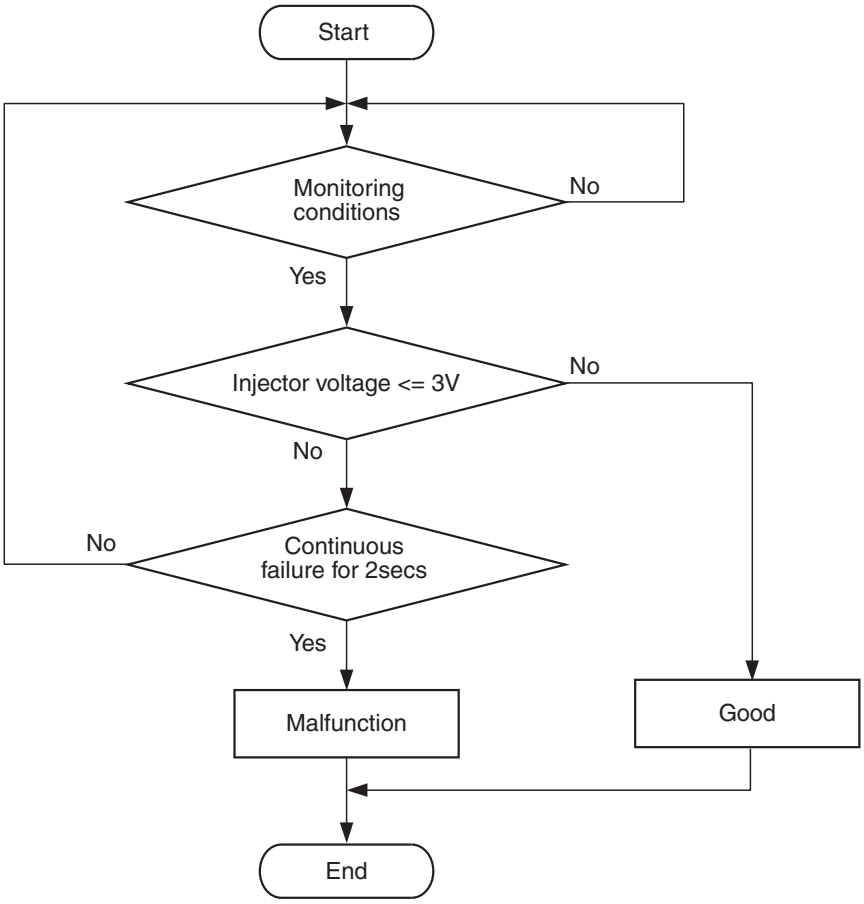
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS <Circuit continuity –open circuit and shorted low>

Logic Flow Chart



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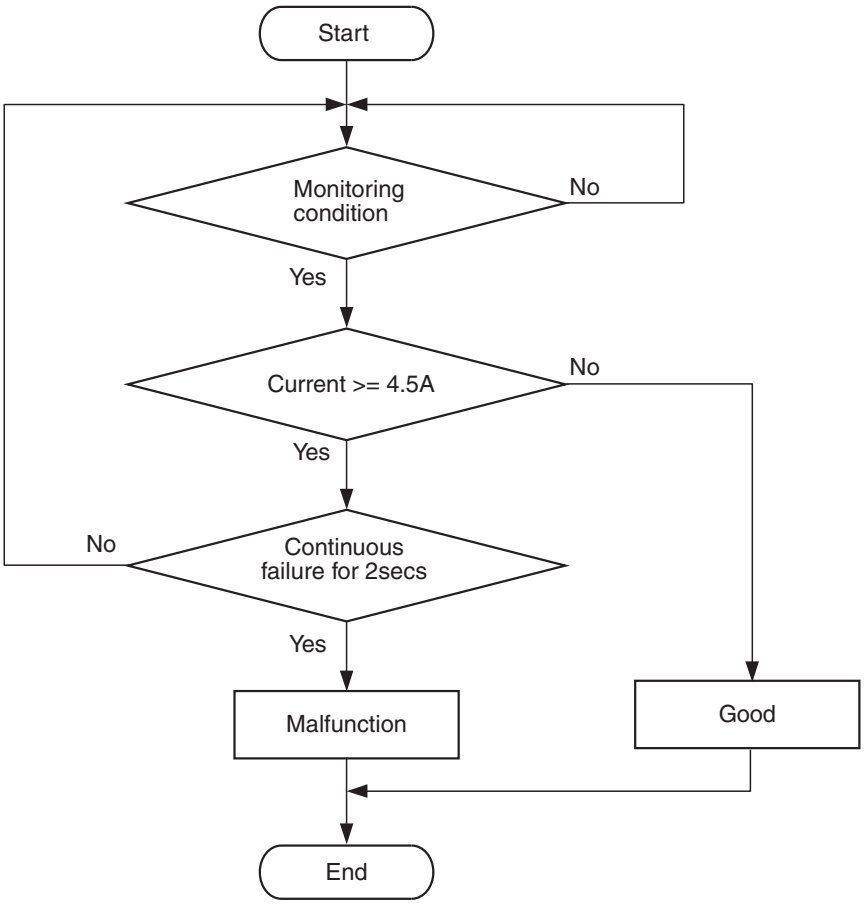
Check Condition
- Engine is running.

Judgement Criterion
- The supply voltage is 3 volts or less without the injector driving for 2 seconds.

DTC SET CONDITIONS <Circuit continuity –shorted high>

Logic Flow Chart



AK604332

Check Condition
- Engine is running.

Judgement Criterion
- The coil current is 4.5 ampere or more with the injector driving for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

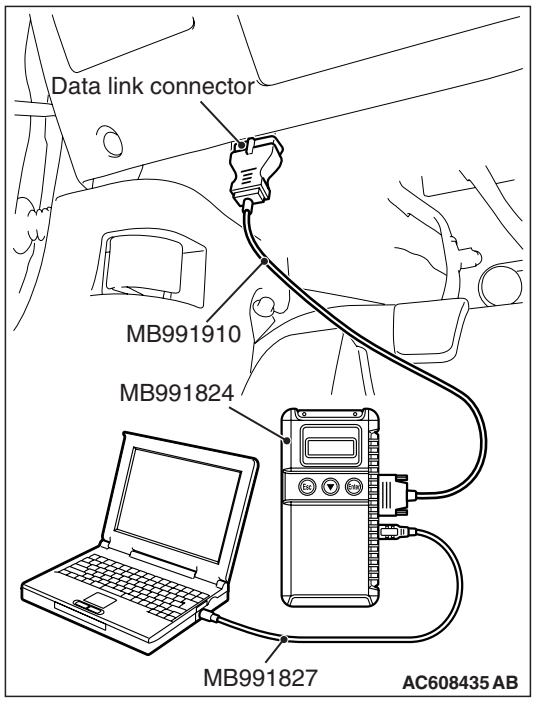
Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- No. 4 cylinder injector failed.
- Open or shorted No. 4 cylinder injector circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check actuator test item 4: No. 4 Injector.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the actuator testing mode for item 4 No. 4 injector.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The idle should become slightly rougher.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

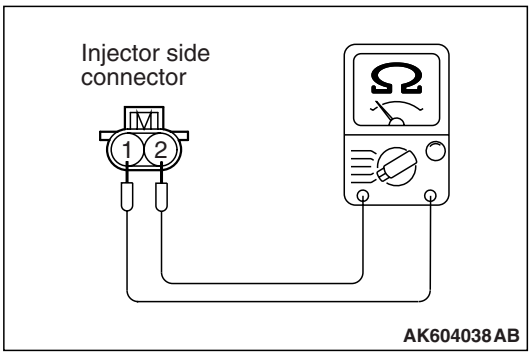
NO : Go to Step 2.

STEP 2. Check harness connector B-104 at No. 4 cylinder injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 3. Check the No. 4 cylinder injector.

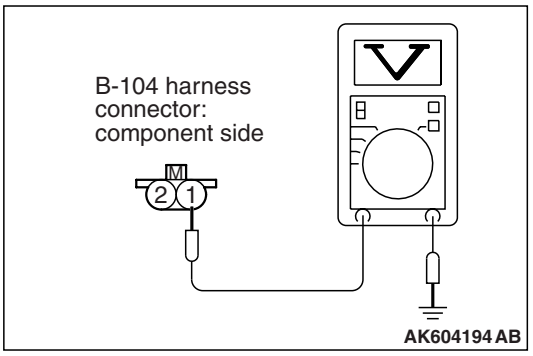
(1) Disconnect the No. 4 cylinder injector connector B-104.
(2) Measure the resistance between injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 4.

NO : Replace the No. 4 cylinder injector. Then go to Step 20.



STEP 4. Measure the power supply voltage at No. 4 cylinder injector connector.

(1) Disconnect connector B-104 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 14.
NO : Go to Step 5.

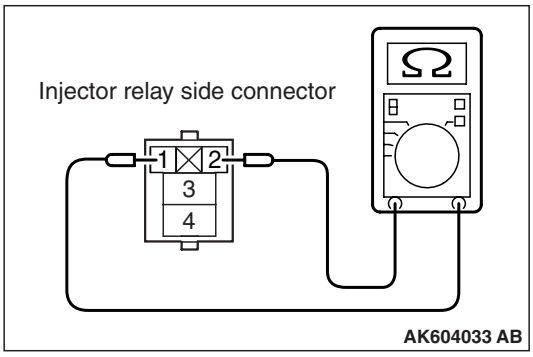
STEP 5. Check harness connector A-21X at injector relay for damage.

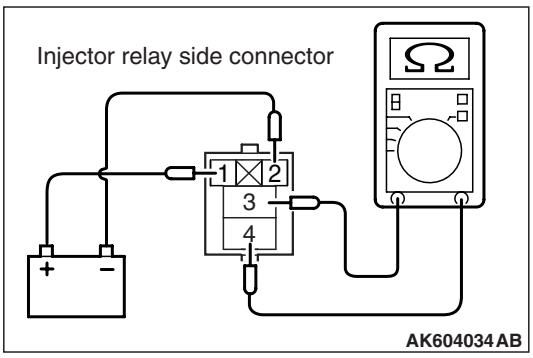
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminal No. 1 and No. 2.
There should be continuity. (approximately 70 ohms)





(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Continuity (2 ohms or less). <Negative battery terminal connected>
- Should be open loop. <Negative battery terminal disconnected>

(5) Install the injector relay.

Q: Is the measured resistance normal?

YES : Go to Step 7.
NO : Replace the injector relay. Then go to Step 20.

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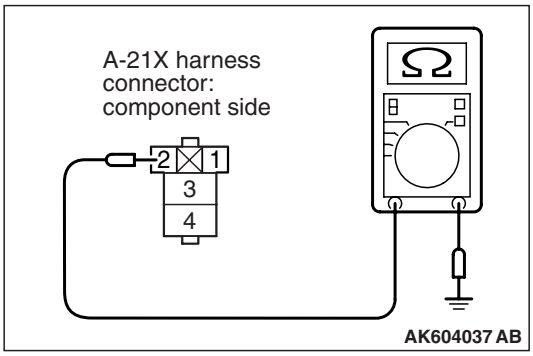
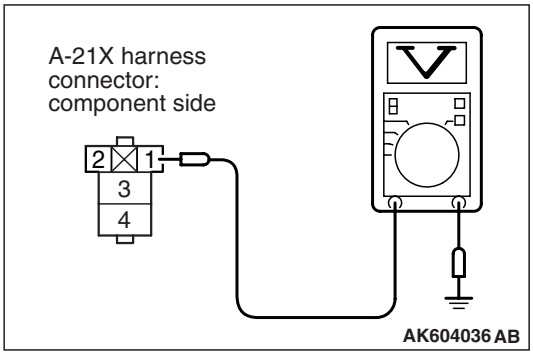


STEP 7. Check for continuity at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 8.
NO : Repair harness wire between injector relay connector A-21X (terminal No. 2) and ground because of open circuit or harness damage. Then go to Step 20.



STEP 8. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

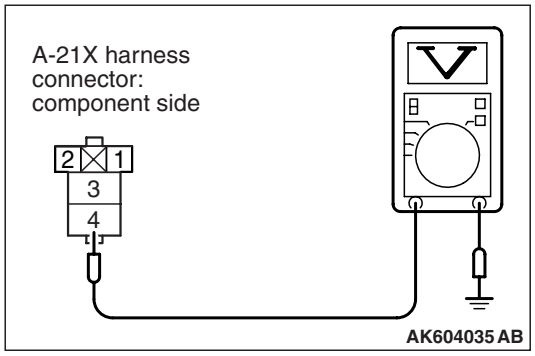
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 9.

STEP 9. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 10. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 12.
NO : Go to Step 11.

STEP 11. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit or short circuit to ground between injector relay connector A-21X (terminal No. 3) and No. 4 cylinder injector connector B-104 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 20.

STEP 13. Check harness connector C-304 at ETACS-ECU for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between injector relay connector A-21X (terminal No. 1) and ETACS-ECU connector C-304 (terminal No. 10) because of harness damage. Then go to Step 20.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

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STEP 14. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 15. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 16.
NO : Repair it. Then go to Step 20.

STEP 16. Check for harness damage between injector relay connector A-21X (terminal No. 3) and No. 4 cylinder injector connector B-104 (terminal No. 1).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20 .

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 20.

STEP 17. Check harness connector B-108 at ECM for damage.

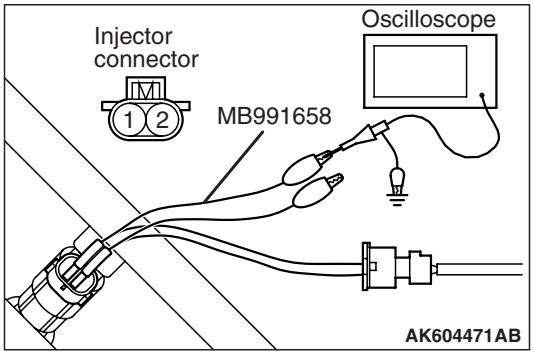
Q: Is the harness connector in good condition?

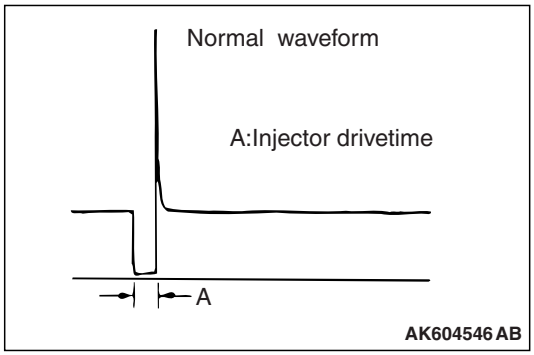
YES : Go to Step 18.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 18. Check for open circuit and short circuit to ground and harness damage between No. 4 cylinder injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.





STEP 19. Using the oscilloscope, check the No. 4 cylinder injector.

(1) Disconnect the No. 4 cylinder injector connector B-104 and connect the test harness special tool MB991658 between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the injector side connector terminal No. 2.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 19.

(3) Start the engine and run at idle.

(4) Measure the waveform.
- The waveform should show a normal pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

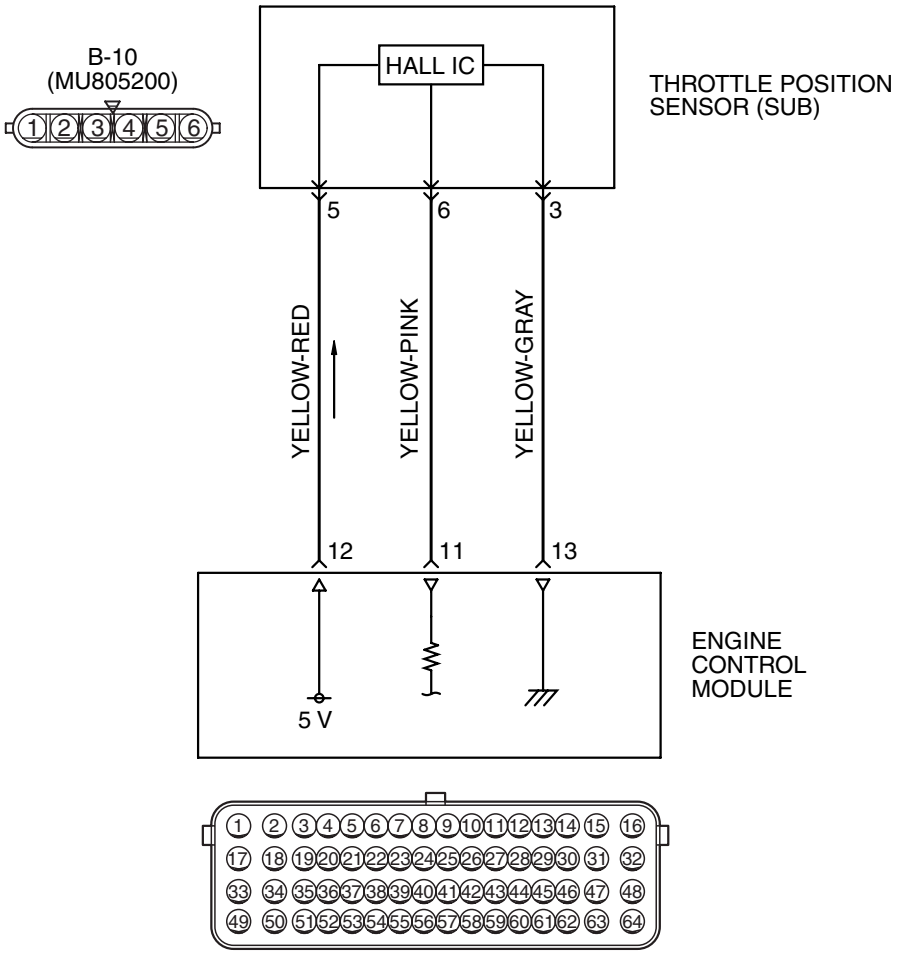
Q: Is DTC P0204 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0222: Throttle Position Sensor (sub) Circuit Low Input

THROTTLE POSITION SENSOR (SUB) CIRCUIT



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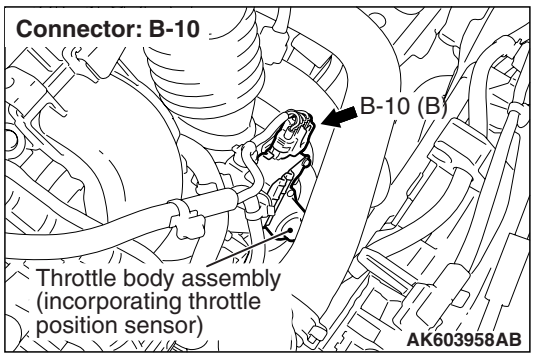

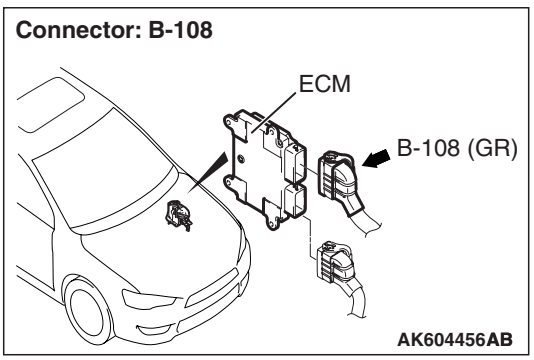

CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 11) from the throttle position sensor (sub) output terminal (terminal No. 6).

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- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

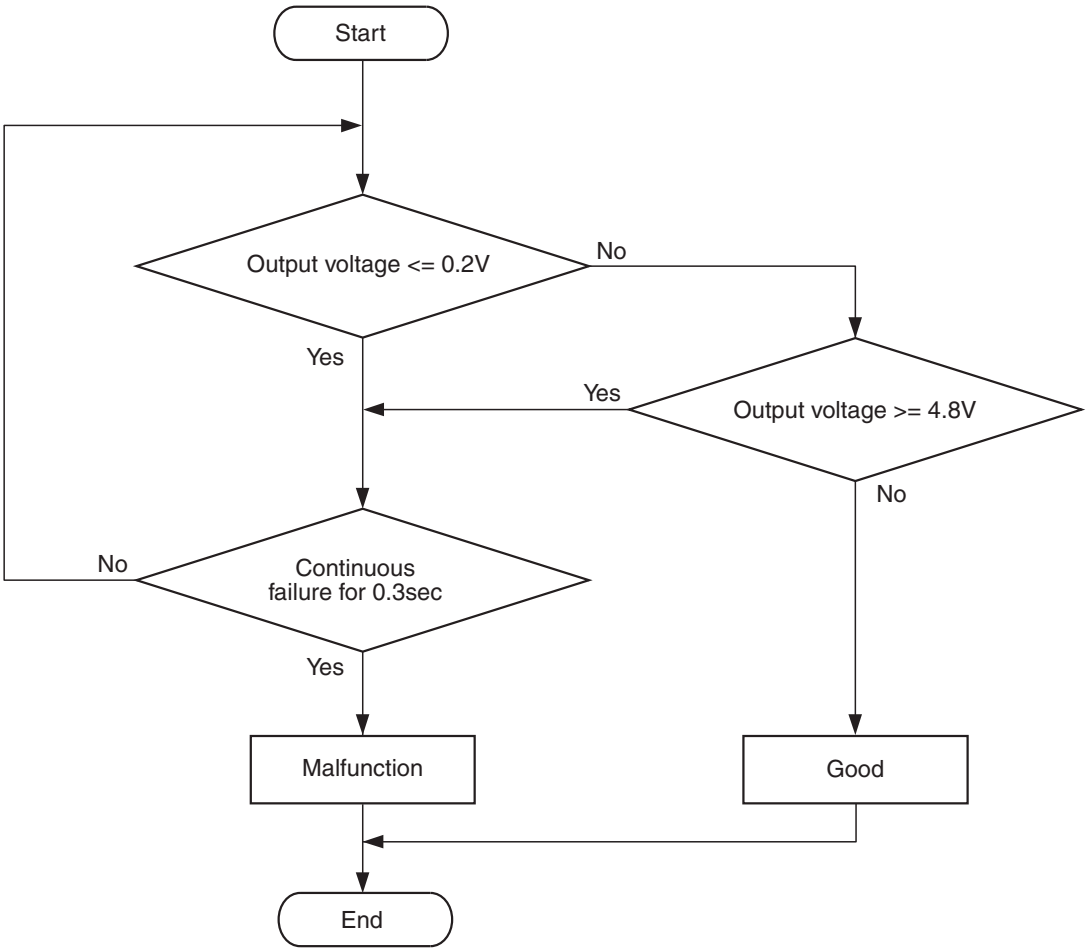
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition

- Ignition switch is "ON" position.

TSB Revision

Judgement Criterion

- Throttle position sensor (sub) output voltage should be 0.2 volt or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

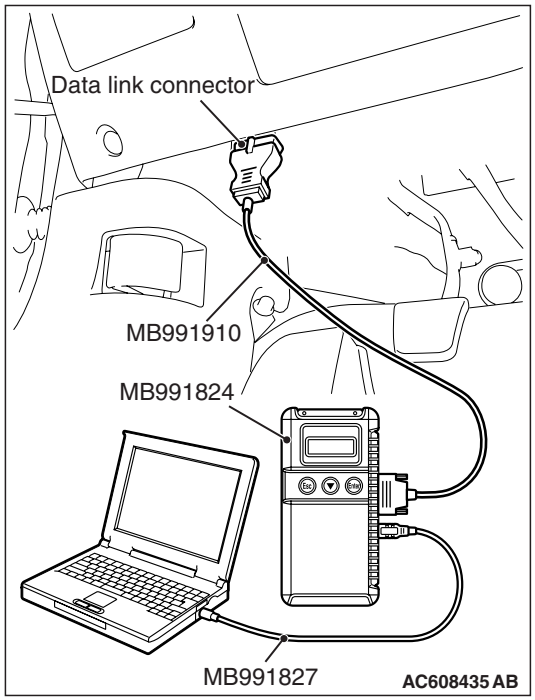
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed.
- Open or shorted throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness



STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

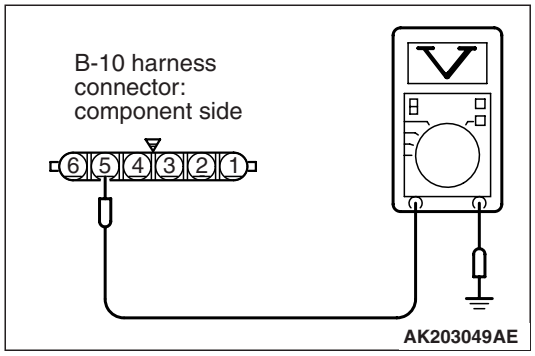
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-10 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at throttle position sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 5 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 5. Check for open circuit and short circuit to ground between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.

STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
- Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

STEP 7. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 8. Check for harness damage between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for open circuit, short circuit to ground and harness damage between throttle position sensor connector B-10 (terminal No. 6) and ECM connector B-108 (terminal No. 11).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP 10. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : The inspection is complete.

STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

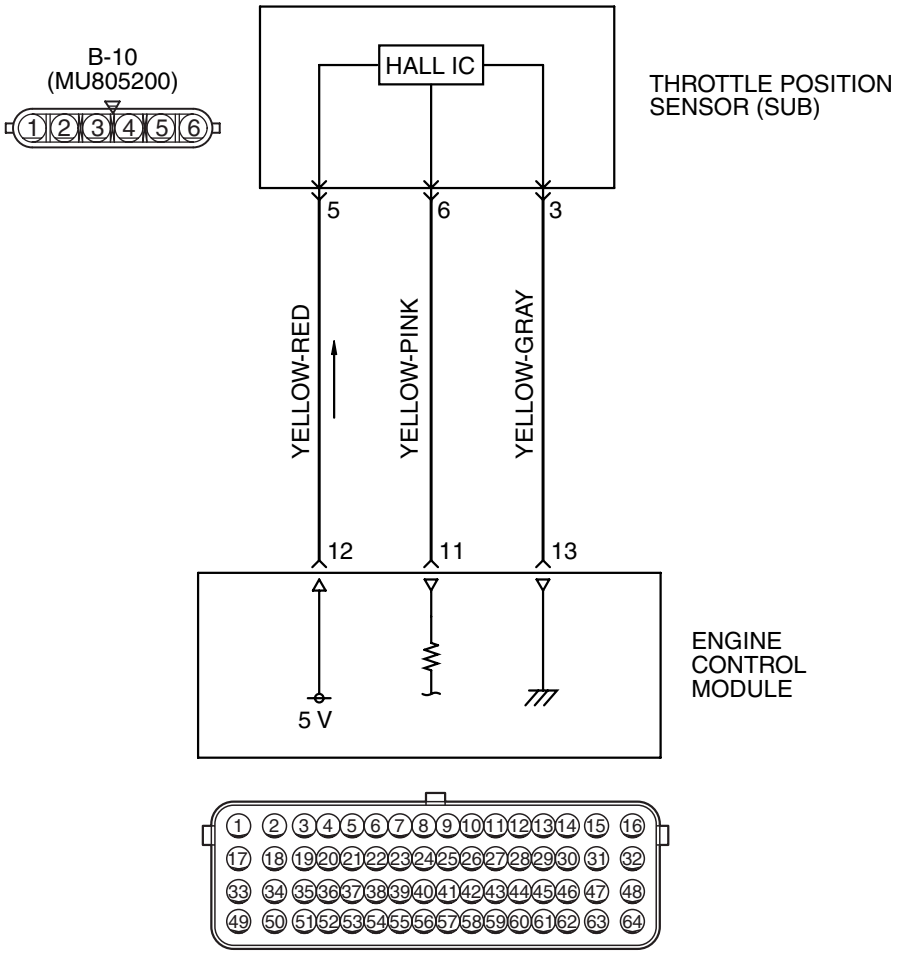
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0222 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0223: Throttle Position Sensor (sub) Circuit High Input

THROTTLE POSITION SENSOR (SUB) CIRCUIT



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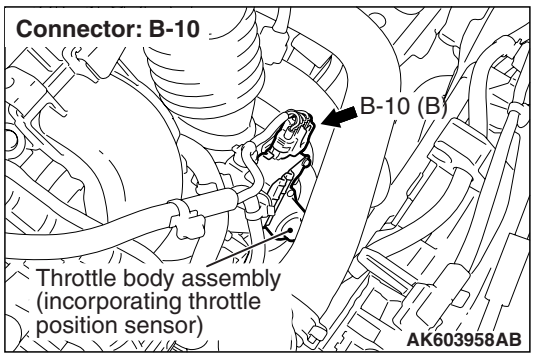
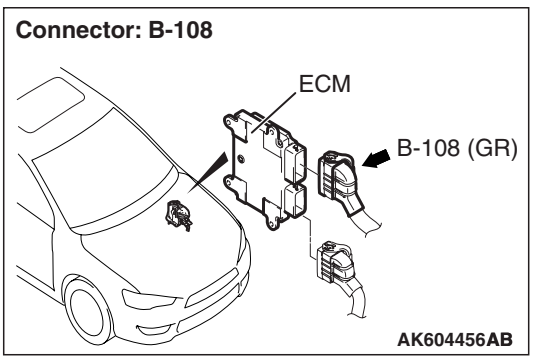




CIRCUIT OPERATION

- A 5-volt power supply is applied on the throttle position sensor (sub) power terminal (terminal No. 5) from the ECM (terminal No. 12).
- A voltage that is according to the throttle opening angle is sent to the ECM (terminal No. 11) from the throttle position sensor (sub) output terminal (terminal No. 6).

TSB Revision

- The ground terminal (terminal No. 3) is grounded with ECM (terminal No. 13).

TECHNICAL DESCRIPTION

- The throttle position sensor (sub) outputs voltage which corresponds to the throttle valve opening angle.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

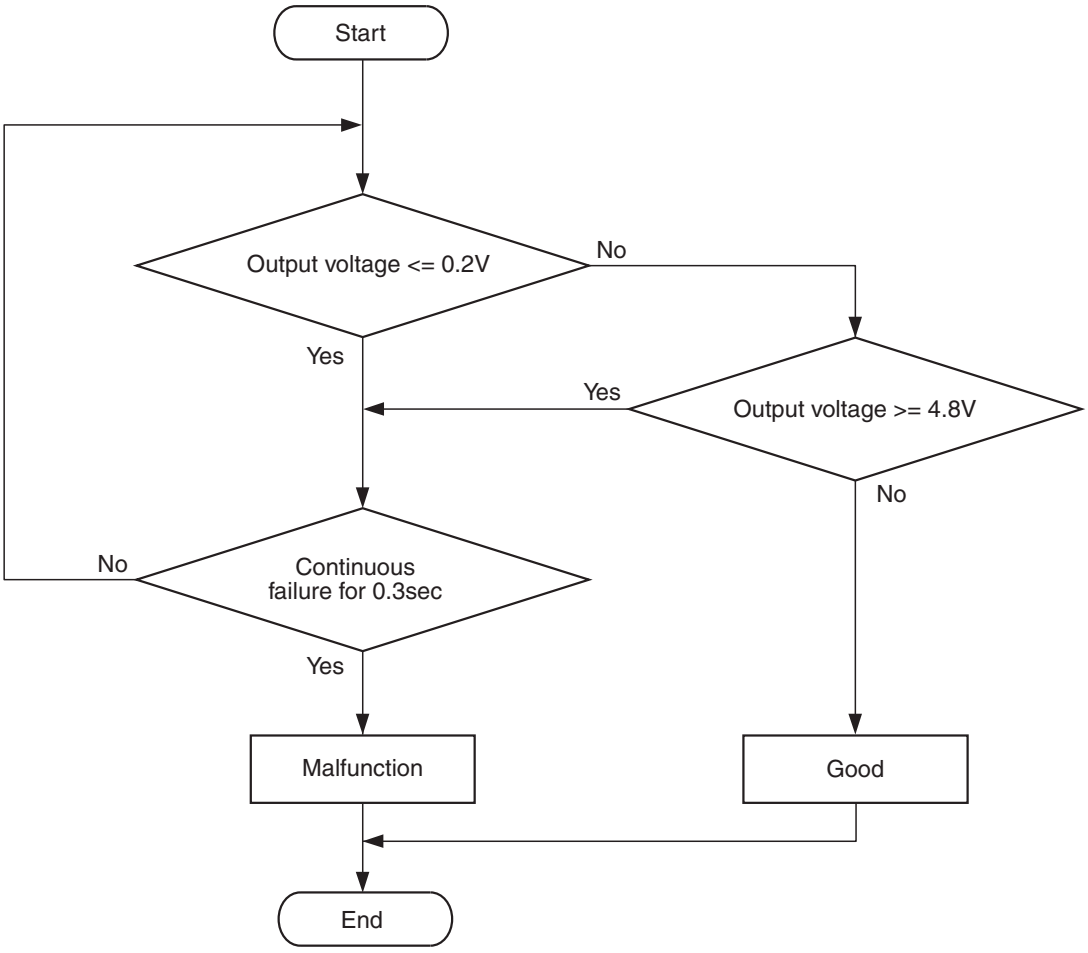
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604318

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Throttle position sensor (sub) output voltage should be 4.8 volts or more for 0.3 second.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

None.

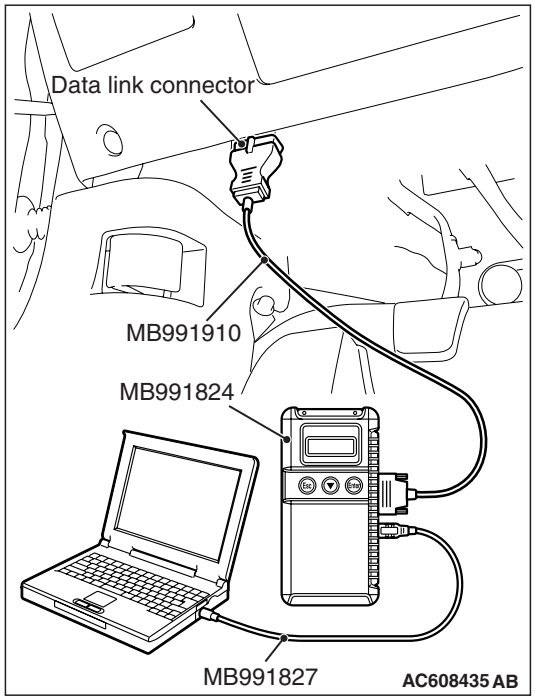
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed.
- Open throttle position sensor (sub) circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness



STEP 1. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Detach the intake air hose at the throttle body.
(4) Disconnect the connector of the throttle position sensor.
(5) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(6) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
  - Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
  - Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.
(7) Turn the ignition switch to the "LOCK" (OFF) position.

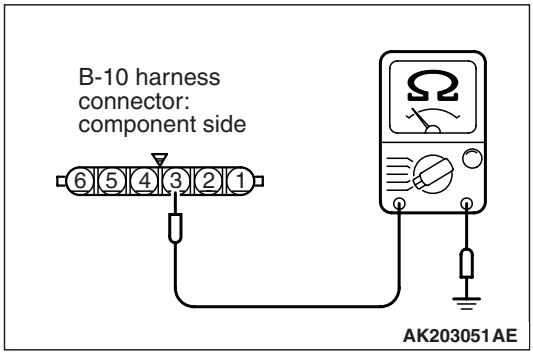
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector B-10 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at throttle position sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Measure the continuity between terminal No. 3 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Check for open circuit and harness damage between throttle position sensor connector B-10 (terminal No. 3) and ECM connector B-108 (terminal No. 13).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
- Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

STEP 7. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0223 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : The inspection is complete.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0223 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0300: Random/Multiple Cylinder Misfire Detected

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

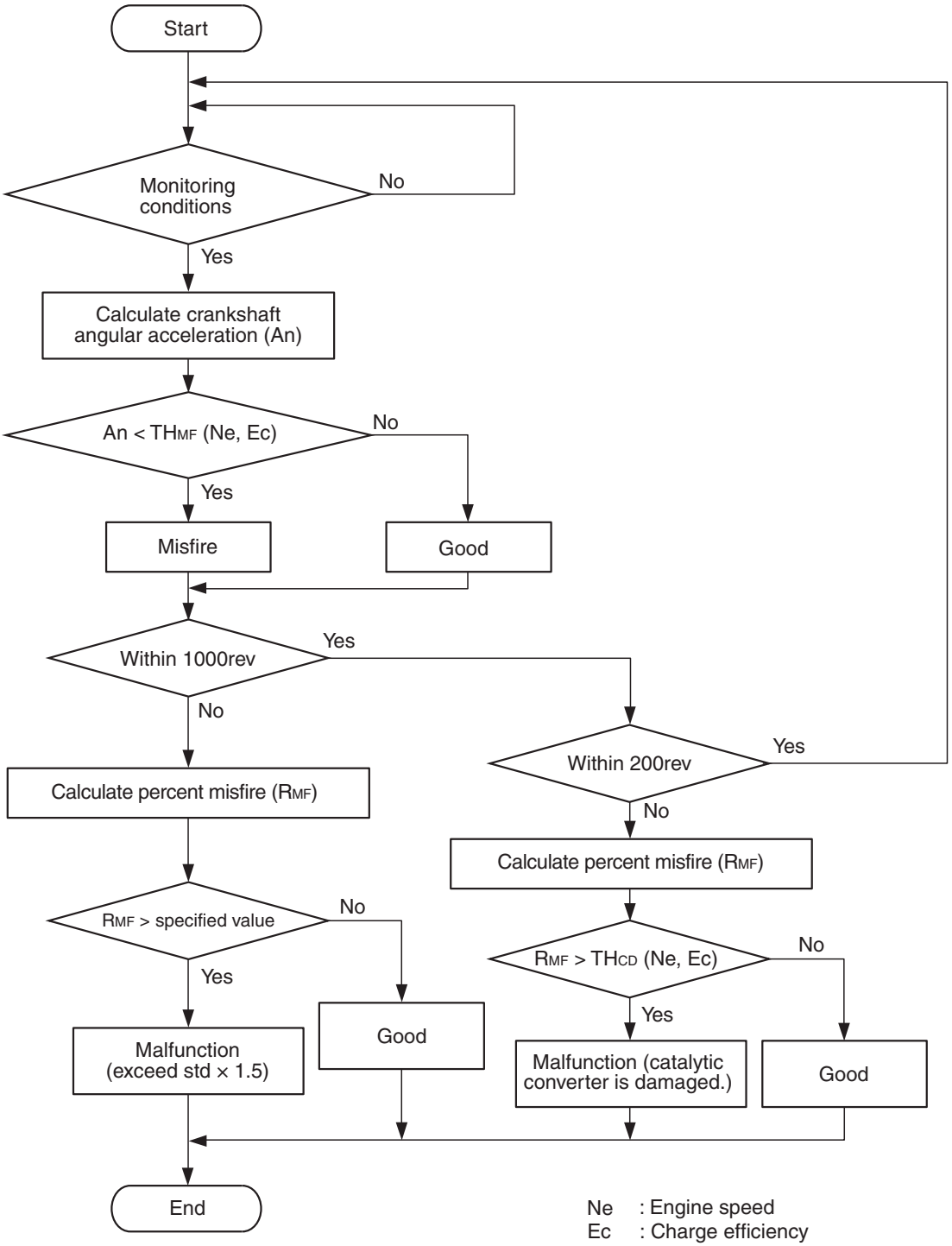
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Engine coolant temperature is higher than −10° C (14° F).

TSB Revision

- Volumetric efficiency is between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is -0.06 V/10 ms to +0.06 V/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

<Except for California>

- Misfire has occurred in 1.7 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

<California>

- Misfire has occurred in 1.6 percent <M/T> or 1.0 percent <CVT> or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13A-10.

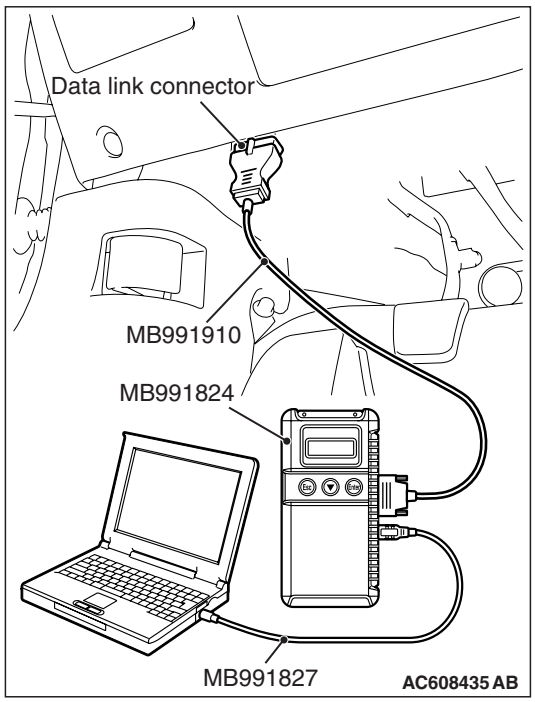
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Poor crankshaft position sensor.
- Incorrect air/fuel ratio.
- Low compression pressure.
- Skipping of timing belt teeth.
- EGR system and EGR valve failed. <California>
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

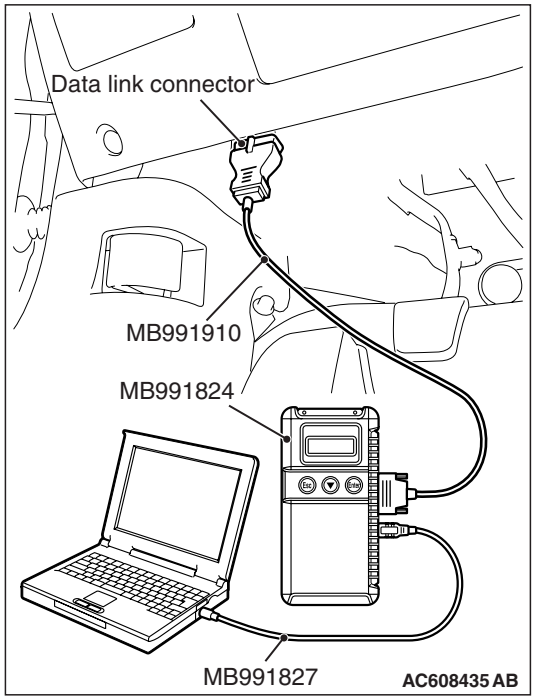
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
  - The tachometer and engine speed indicated on the scan tool should match.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Refer to, DTC P0335 –Crankshaft Position Sensor Circuit P.13A-449.



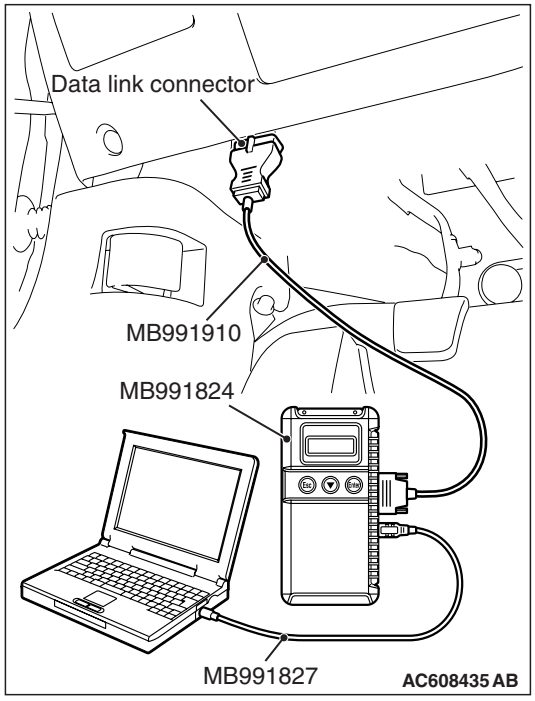
STEP 2. Using scan tool MB991958, check data list item 26: Long-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 26, Long-Term Fuel Trim.
- The fuel trim should be between –12.5 and +12.5 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 3.
NO : Refer to DTC P0171 –System too Lean P.13A-336, DTC P0172 –System too Rich P.13A-342.



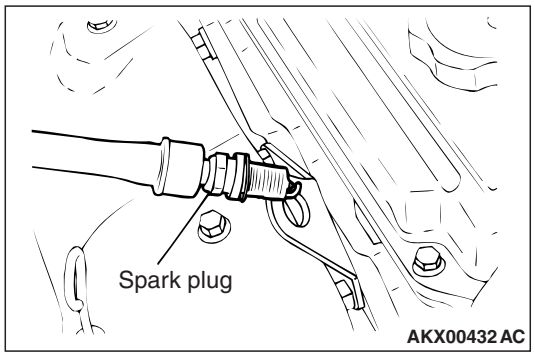
STEP 3. Using scan tool MB991958, check data list item 28: Short-Term Fuel Trim.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 28, Short-Term Fuel Trim.
- The fuel trim should be between –7.4 and +7.4 percent when the engine is 2,500 r/min (during closed loop) after the engine is warmed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the specification normal?

YES : Go to Step 4.
NO : Refer to DTC P0171 –System too Lean P.13A-336, DTC P0172 –System too Rich P.13A-342.



STEP 4. Visual check of ignition spark.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check each spark plug produces a spark.

Q: Did it spark?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning.P.16-37

Q: Is the spark plug normal?

YES : Refer to Symptom Procedures 25 –Ignition Circuit System P.13A-866.
NO : Replace the faulty spark plug. Then go to Step 8.

STEP 6. Check the following items.

(1) Check the following items, and repair or replace the defective component.
  a. Check for skipped timing belt teeth.
  b. Check compression.
  c. EGR valve failed. <California>

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 8.
NO : Go to Step 7.

STEP 7. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 8. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0300 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0301: Cylinder 1 Misfire Detected

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

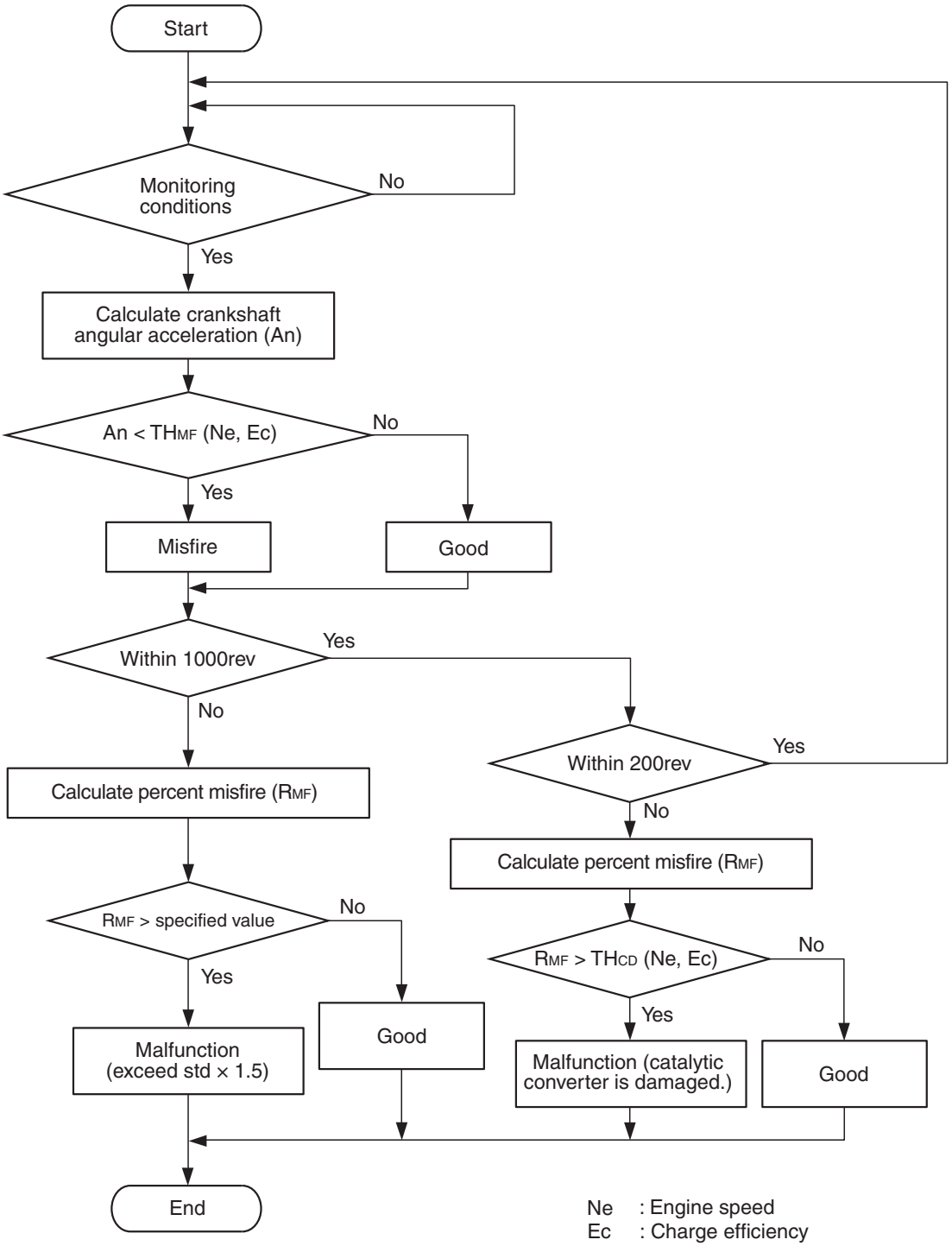
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Engine coolant temperature is higher than −10° C (14° F).

TSB Revision

- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is -0.06 V/10 ms to +0.06 V/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

<Except for California>

- Misfire has occurred in 1.7 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

<California>

- Misfire has occurred in 1.6 percent <M/T> or 1.0 percent <CVT> or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13A-10.

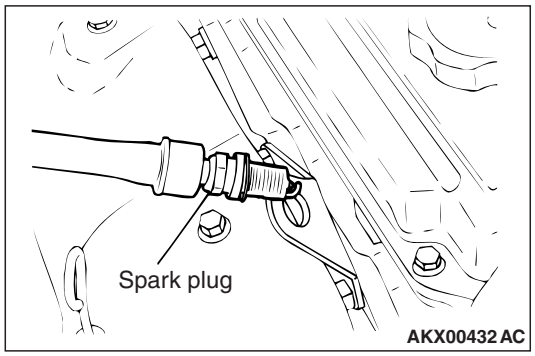
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 1 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.



Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 1 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-37.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 25 –Ignition Circuit System P.13A-866.
NO : Replace the No. 1 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service –Compression Pressure Check P.11A-16.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0301 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0302: Cylinder 2 Misfire Detected

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

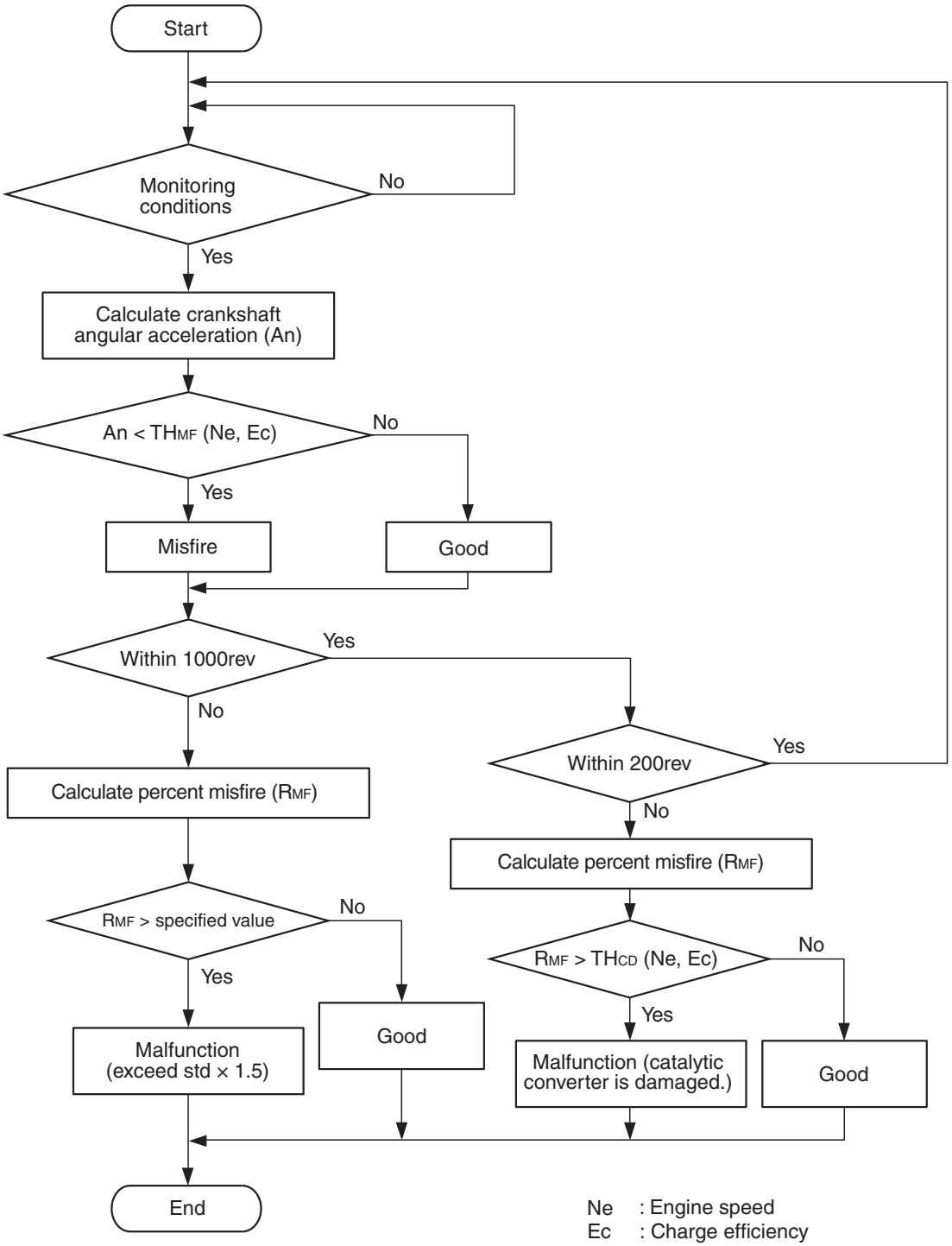
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604333

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Engine coolant temperature is higher than −10° C (14° F).

TSB Revision

- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is -0.06 V/10 ms to +0.06 V/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

<Except for California>

- Misfire has occurred in 1.7 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

<California>

- Misfire has occurred in 1.6 percent <M/T> or 1.0 percent <CVT> or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13A-10.

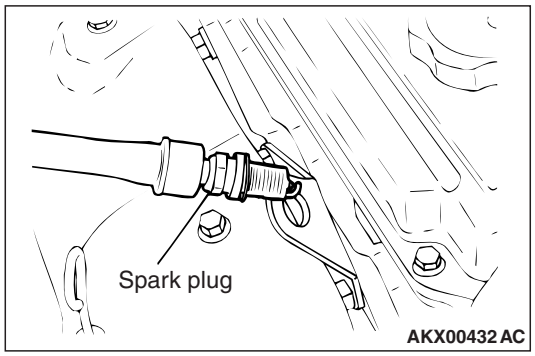
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 2 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.



Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 2 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-37.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 25 –Ignition Circuit System P.13A-866.
NO : Replace the No. 2 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service –Compression Pressure Check P.11A-16.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0302 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0303: Cylinder 3 Misfire Detected

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

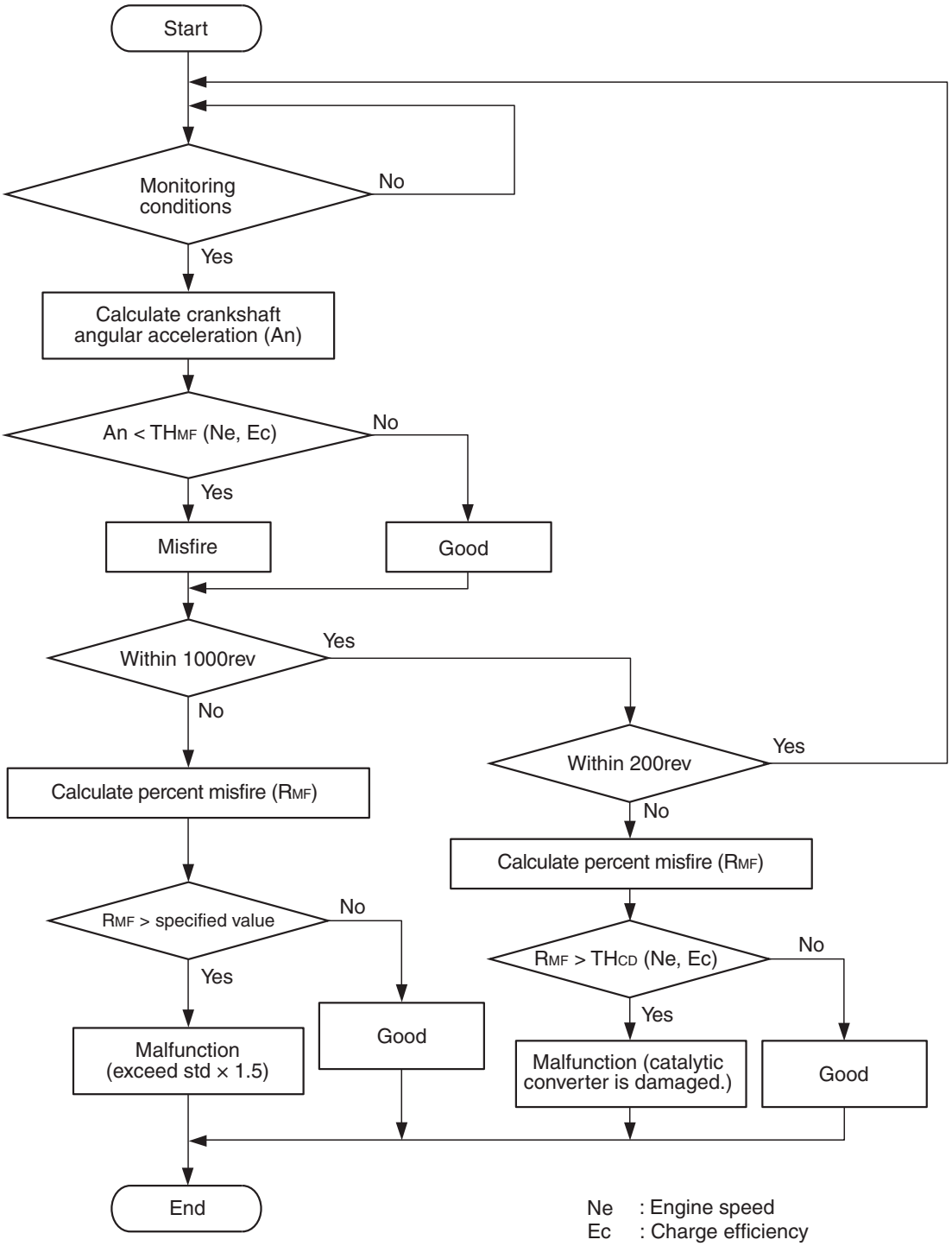
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



Ne : Engine speed
Ec : Charge efficiency
THMF : Threshold value for misfire
THCD : Threshold value for catalyst damage

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TSB Revision

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is –0.06 V/10 ms to +0.06 V/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

<Except for California>

- Misfire has occurred in 1.7 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

<California>

- Misfire has occurred in 1.6 percent <M/T> or 1.0 percent <CVT> or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13A-10.

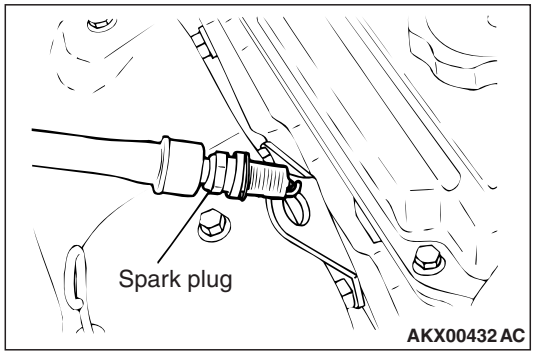
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 3 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces a spark.



Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.

STEP 2. Check the No. 3 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-37.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 25 –Ignition Circuit System P.13A-866.
NO : Replace the No. 3 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.
Refer to GROUP 11A, On-vehicle Service –Compression Pressure Check P.11A-16.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0303 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0304: Cylinder 4 Misfire Detected

TECHNICAL DESCRIPTION

- If a misfire occurs while the engine is running, the engine speed changes for an instant.
- The ECM checks for such changes in engine speed.

DESCRIPTIONS OF MONITOR METHODS

Monitor angular acceleration of crankshaft and detect malfunction when negative variation of the angular acceleration is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

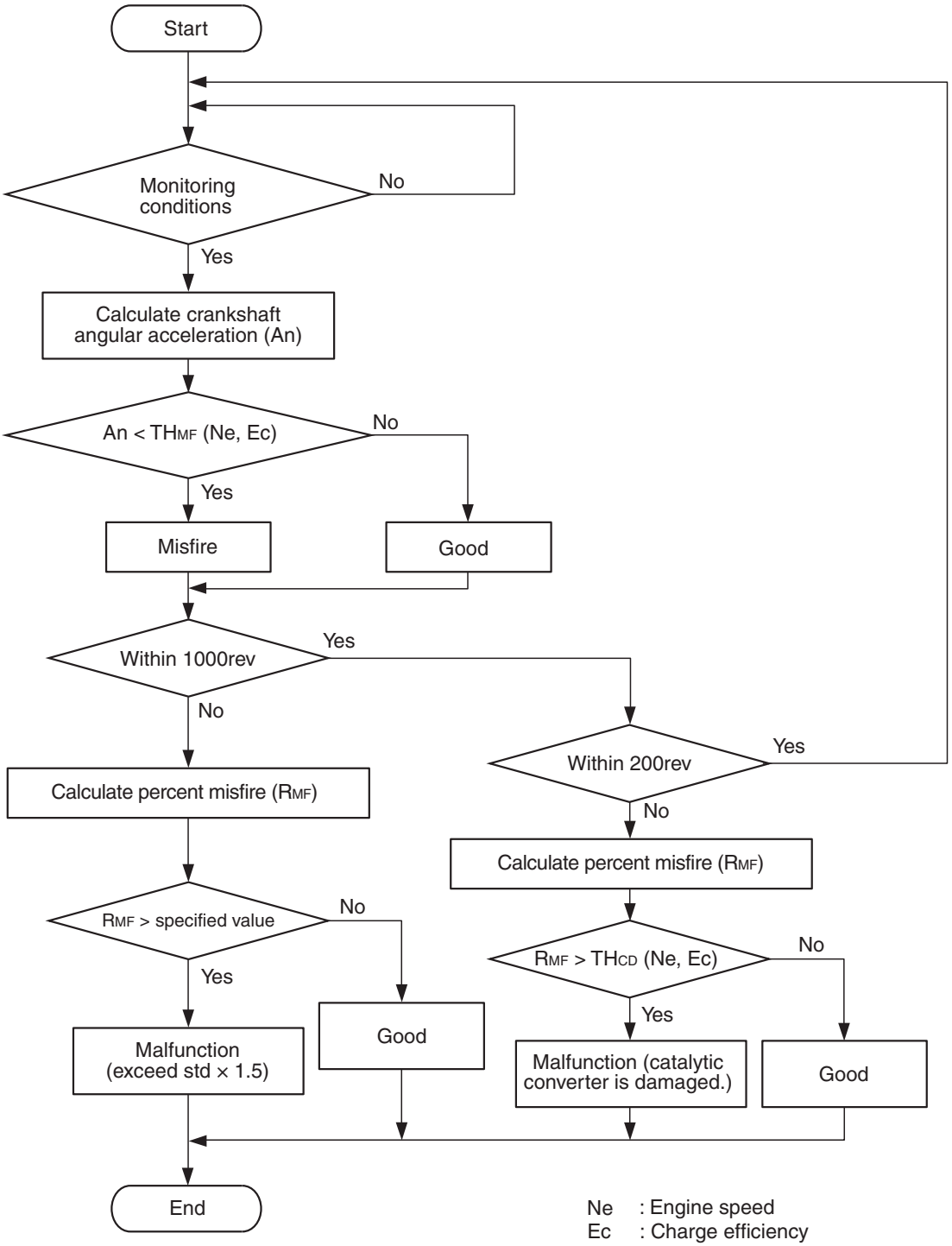
Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



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TSB Revision

Check Conditions

- Engine speed is between 438 and 6,594 r/min.
- Engine coolant temperature is higher than −10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Volumetric efficiency is at between 30 and 60 percent.
- Adaptive learning is complete for the vane which generates a crankshaft position signal.
- While the engine is running, excluding gear shifting, deceleration, sudden acceleration/deceleration and A/C compressor switching.
- The throttle deviation is −0.06 V/10 ms to +0.06 V/10 ms.

Judgement Criteria (change in the angular acceleration of the crankshaft is used for misfire detection)

- Misfire has occurred more frequently than allowed during the last 200 revolutions [when the catalyst temperature is higher than 1,000° C (1,832° F)].

or

<Except for California>

- Misfire has occurred in 1.7 percent or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

<California>

- Misfire has occurred in 1.6 percent <M/T> or 1.0 percent <CVT> or more of the last 1,000 revolutions (corresponding to 1.5 times the limit of emission standard).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 15 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Ignition system related part(s) failed.
- Low compression pressure.
- ECM failed.

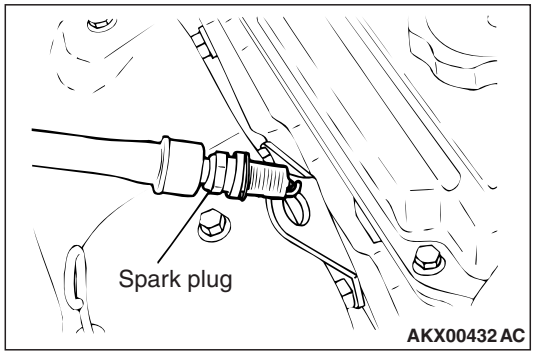
DIAGNOSIS

STEP 1. Visual check on ignition spark of No. 4 cylinder.

(1) Remove the spark plug and install it to the ignition coil.
(2) Connect the ignition coil connector.
(3) Remove all injector connector.
(4) At the engine start, check spark plug produces spark.

Q: Did it spark?

YES : Go to Step 3.
NO : Go to Step 2.



STEP 2. Check the No. 4 cylinder spark plug.

Refer to GROUP 16, Ignition System –On-vehicle Service – Spark Plug Check And Cleaning P.16-37.

Q: Is the spark plug normal?

YES : Refer to, Symptom Procedures 25 –Ignition Circuit System P.13A-866.
NO : Replace the No. 4 cylinder spark plug. Then go to Step 5.

STEP 3. Check the compression.

Refer to GROUP 11A, On-vehicle Service –Compression Pressure Check P.11A-16.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0304 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.

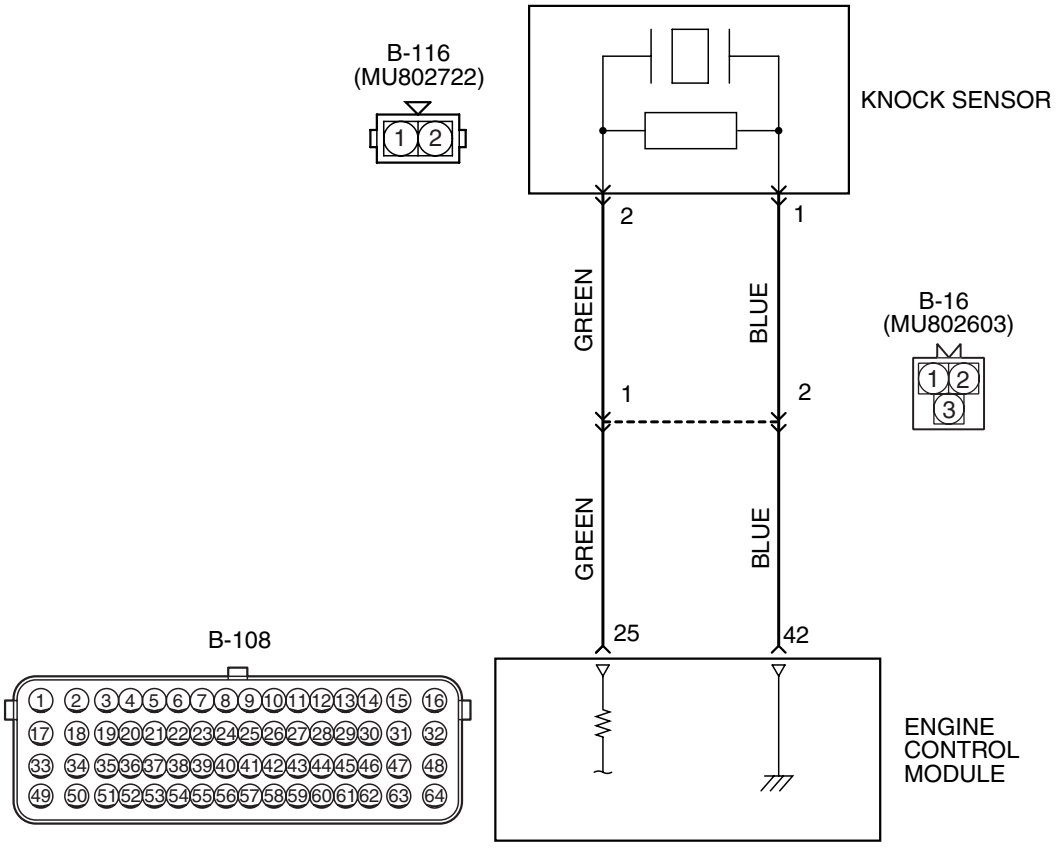
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 15 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0304 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0326: Knock Sensor Circuit Performance

KNOCK SENSOR CIRCUIT



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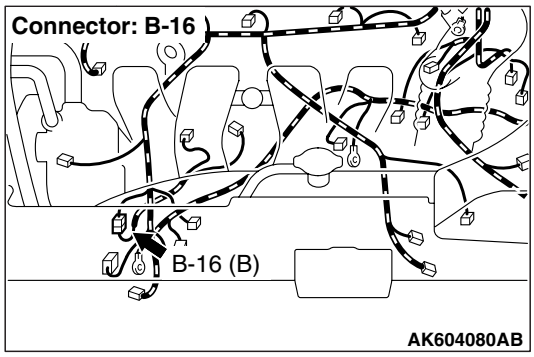

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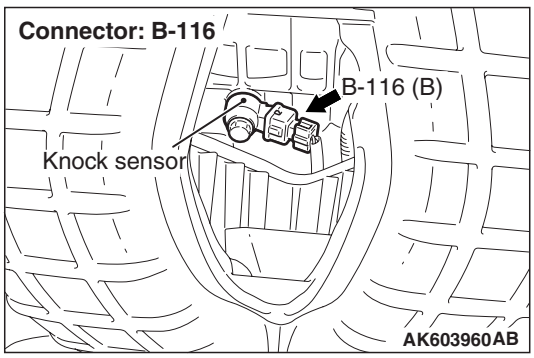

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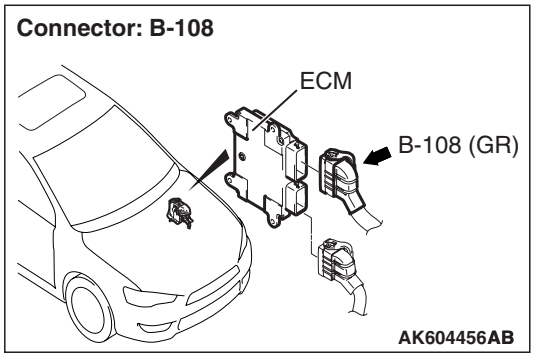

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TSB Revision

CIRCUIT OPERATION

- The knock sensor (terminal No. 2) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 1) is grounded with ECM (terminal No. 42).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change.
- The ECM checks whether the output voltage changes.

DTC SET CONDITIONS

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Engine speed is higher than 3,000 r/min.
- Volumetric efficiency is 40 percent or more.

Judgement Criterion

- Knock sensor output voltage (knock sensor peak voltage in each 1/2 turn of the crankshaft) has not changed more than 0.06 volt in the last consecutive 200 periods.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

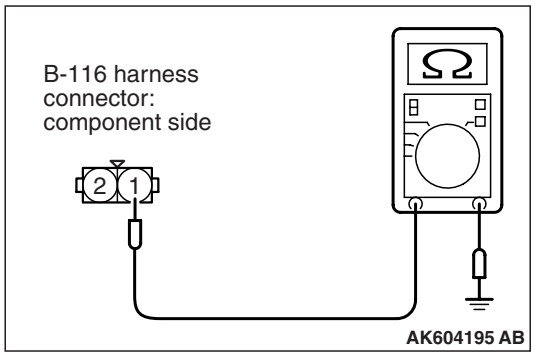
STEP 1. Check harness connector B-116 at the knock sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 2. Check the continuity at knock sensor harness side connector B-116.

(1) Disconnect the connector B-116 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
  - Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 4. Check for open circuit and harness damage between knock sensor connector B-116 (terminal No. 1) and ECM connector B-108 (terminal No. 42).

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : Repair it. Then go to Step 8.

STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 6. Check for open circuit and short circuit to ground and harness damage between knock sensor connector B-116 (terminal No. 2) and ECM connector B-108 (terminal No. 25).

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.

STEP 7. Replace the knock sensor.

(1) Replace the knock sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0326 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : Replace the knock sensor. Then go to Step 8.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

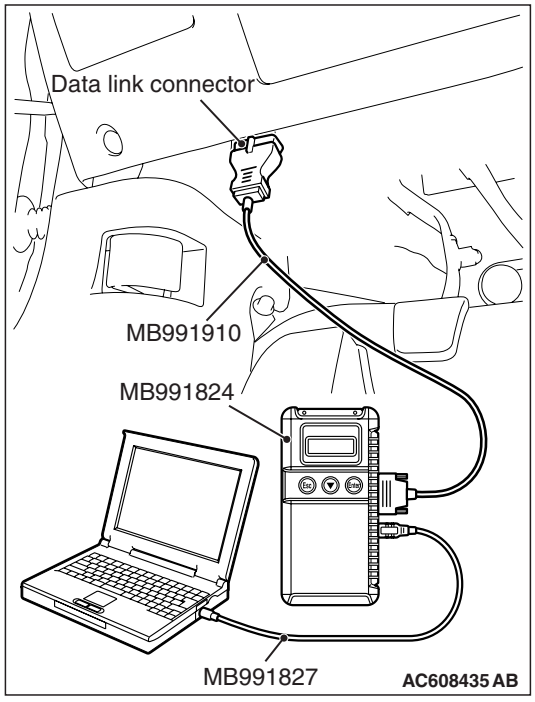
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3,000 –5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

(5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

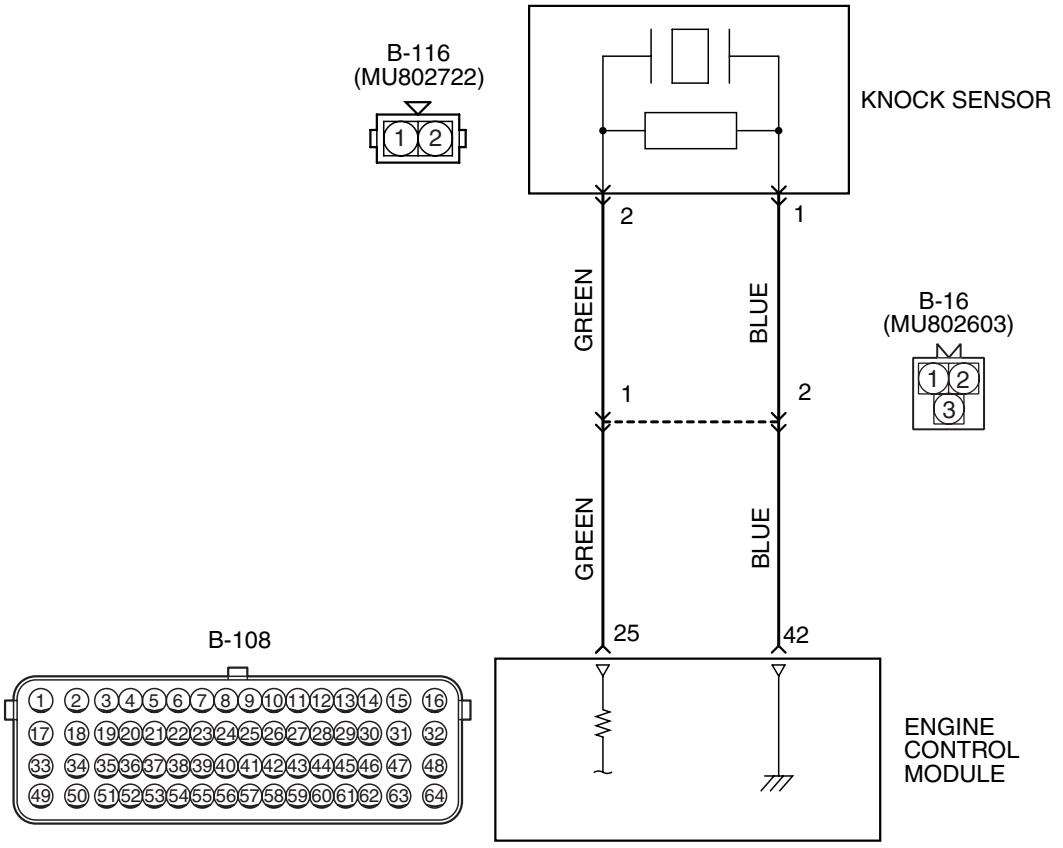
Q: Is DTC P0326 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.



DTC P0327: Knock Sensor Circuit Low

KNOCK SENSOR CIRCUIT



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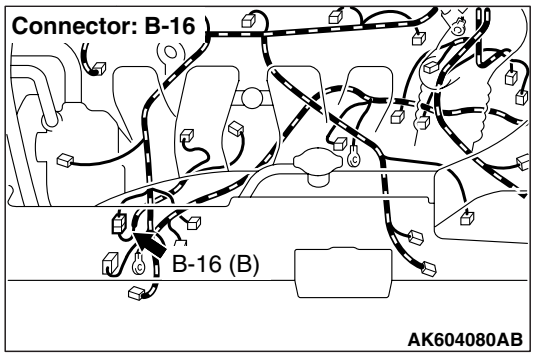

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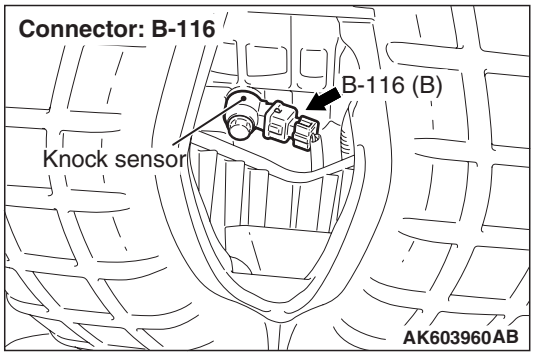

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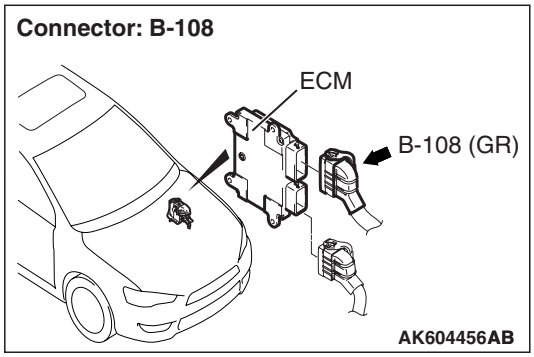

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TSB Revision

CIRCUIT OPERATION

- The knock sensor (terminal No. 2) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 1) is grounded with ECM (terminal No. 42).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.
- The ECM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Knock sensor output voltage has continued to be lower than 0.5 volt for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Knock sensor failed.
- Open or shorted knock sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

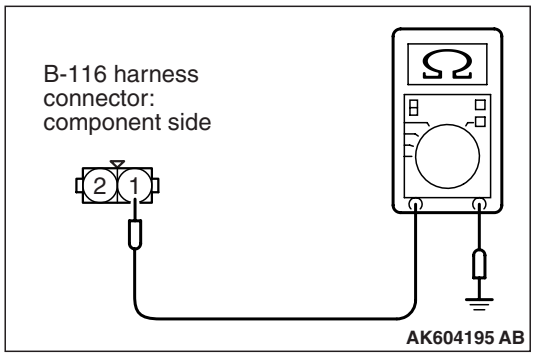
STEP 1. Check harness connector B-116 at the knock sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 2. Check the continuity at knock sensor harness side connector B-116.

(1) Disconnect the connector B-116 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
  - Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 5.
NO : Go to Step 3.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

TSB Revision

STEP 4. Check for open circuit between knock sensor connector B-116 (terminal No. 1) and ECM connector B-108 (terminal No. 42).

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : Repair it. Then go to Step 8.

STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 6. Check for open circuit and short circuit to ground between knock sensor connector B-116 (terminal No. 2) and ECM connector B-108 (terminal No. 25).

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

Q: Is the harness wire in good condition?

YES : Go to Step 7.

NO : Repair it. Then go to Step 8.

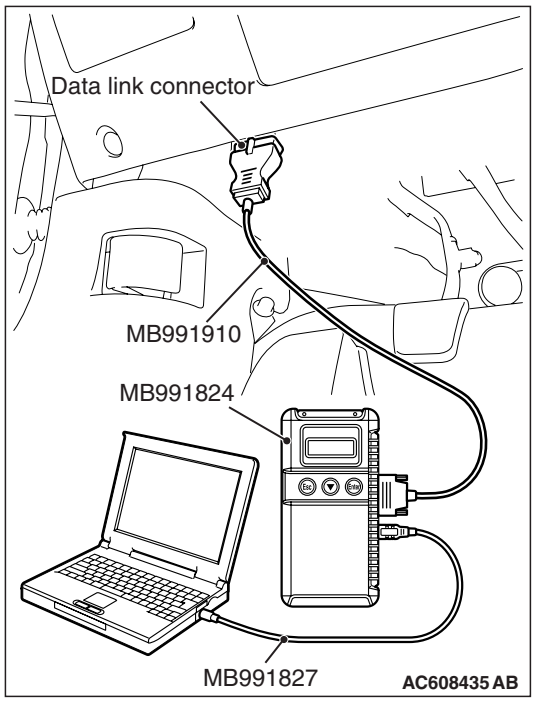
STEP 7. Replace the knock sensor.

(1) Replace the knock sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0327 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : Replace the knock sensor. Then go to Step 8.



STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3,000 –5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

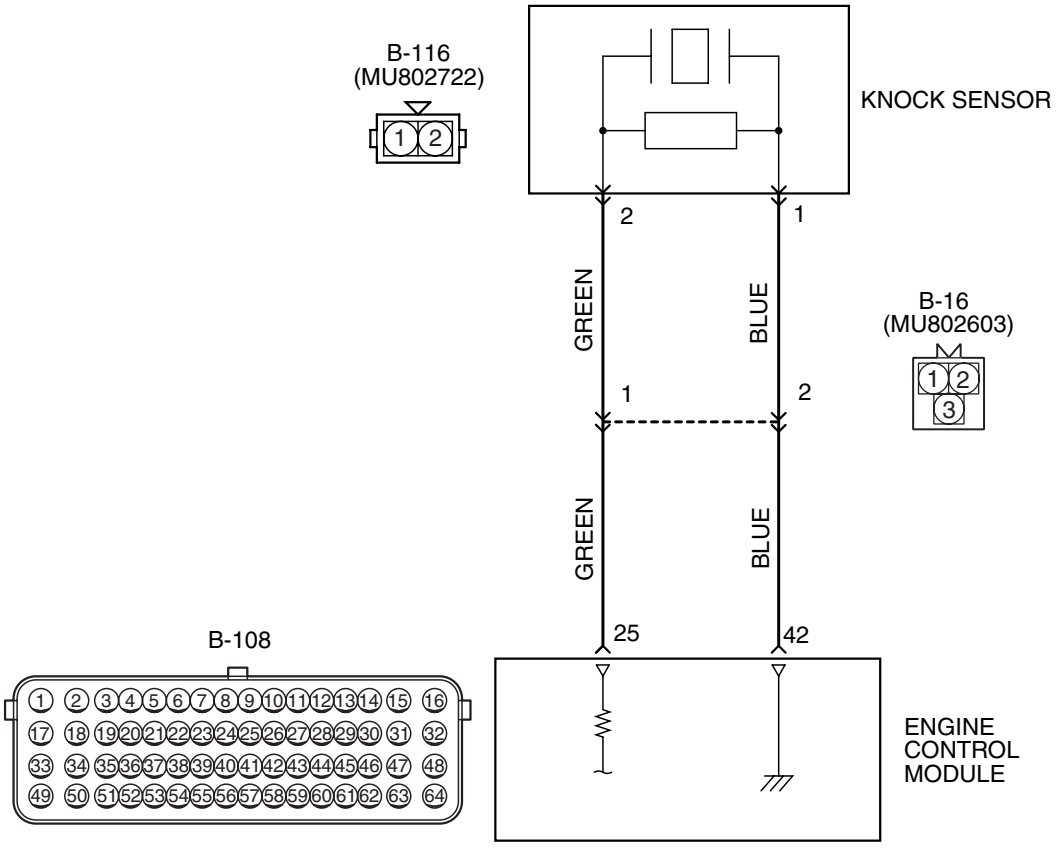
(5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0327 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0328: Knock Sensor Circuit High

KNOCK SENSOR CIRCUIT



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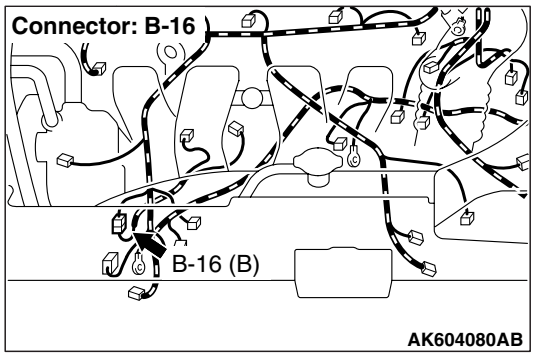

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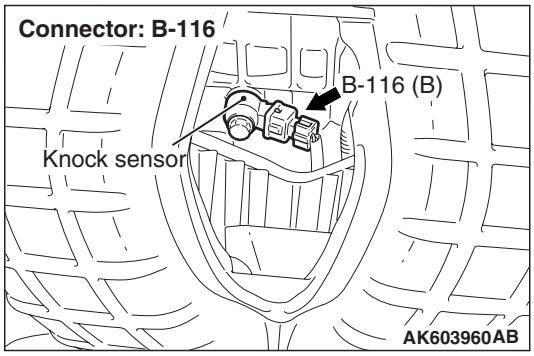

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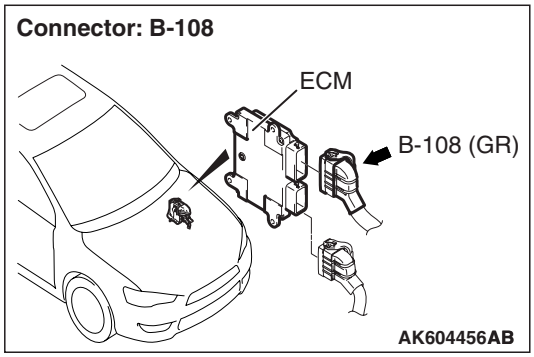

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TSB Revision

CIRCUIT OPERATION

- The knock sensor (terminal No. 2) sends a signal voltage to the ECM (terminal No. 25).
- The ground terminal (terminal No. 1) is grounded with ECM (terminal No. 42).

TECHNICAL DESCRIPTION

- The knock sensor converts the vibration of the cylinder block into a voltage and outputs it.
- The ECM checks whether the voltage is within a specified range.

DTC SET CONDITIONS

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Knock sensor output voltage has continued to be higher than 2.25 volts for 2 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Shorted knock sensor circuit or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-116 at the knock sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

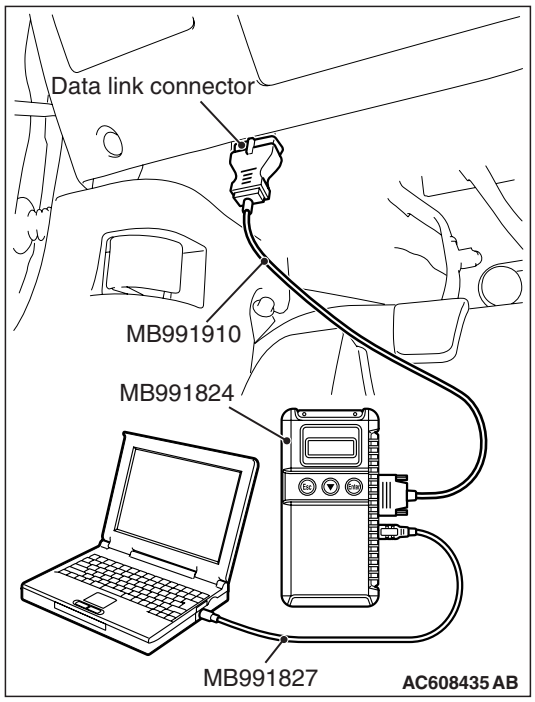
STEP 2. Check for short circuit to power supply between knock sensor connector B-116 (terminal No. 2) and ECM connector B-108 (terminal No. 25).

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 3.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : Repair it. Then go to Step 3.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Test drive under the following conditions:
- Engine speed: 3,000 –5,000 r/min
- Engine load: 40 % or more
- Drive a minimum of 3 seconds after the above conditions have been met.

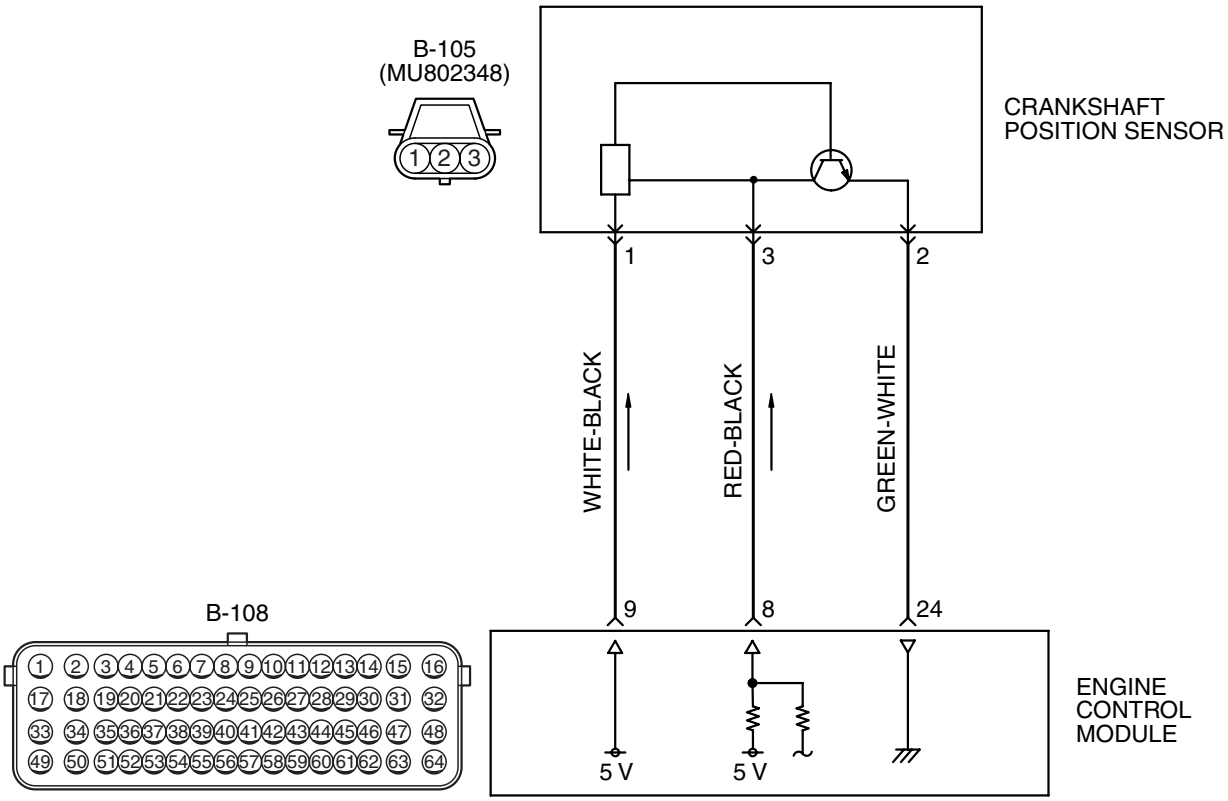
(5) After completing the test drive, read the DTC. Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0328 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0335: Crankshaft Position Sensor Circuit

CRANKSHAFT POSITION SENSOR CIRCUIT



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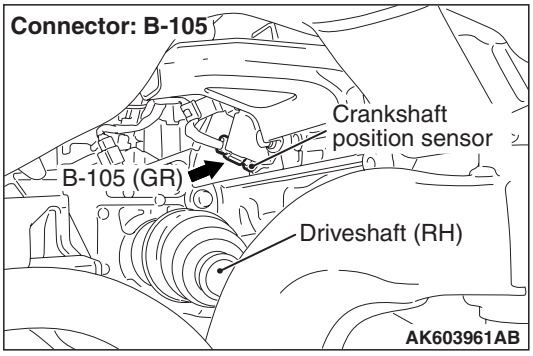
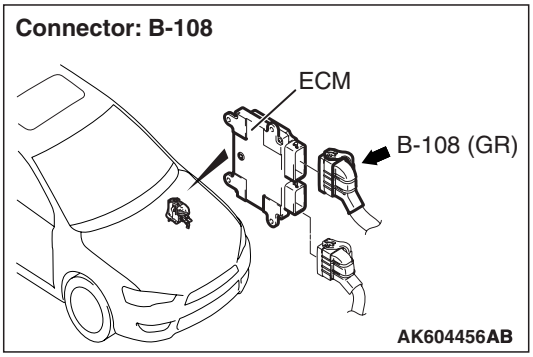




CIRCUIT OPERATION

- The crankshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the crankshaft position sensor is grounded with ECM (terminal No. 24).
- A 5-volt voltage is applied on the crankshaft position sensor output terminal (terminal No. 2) from the ECM (terminal No. 8). The crankshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TSB Revision

TECHNICAL DESCRIPTION

- The crankshaft position sensor detects the crank angle (position) of each cylinder, and converts that data to pulse signals, then which are input to the ECM.
- When the engine is running, the crankshaft position sensor outputs a pulse signal.
- The ECM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Crankshaft position sensor signal does not change.
- Crankshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

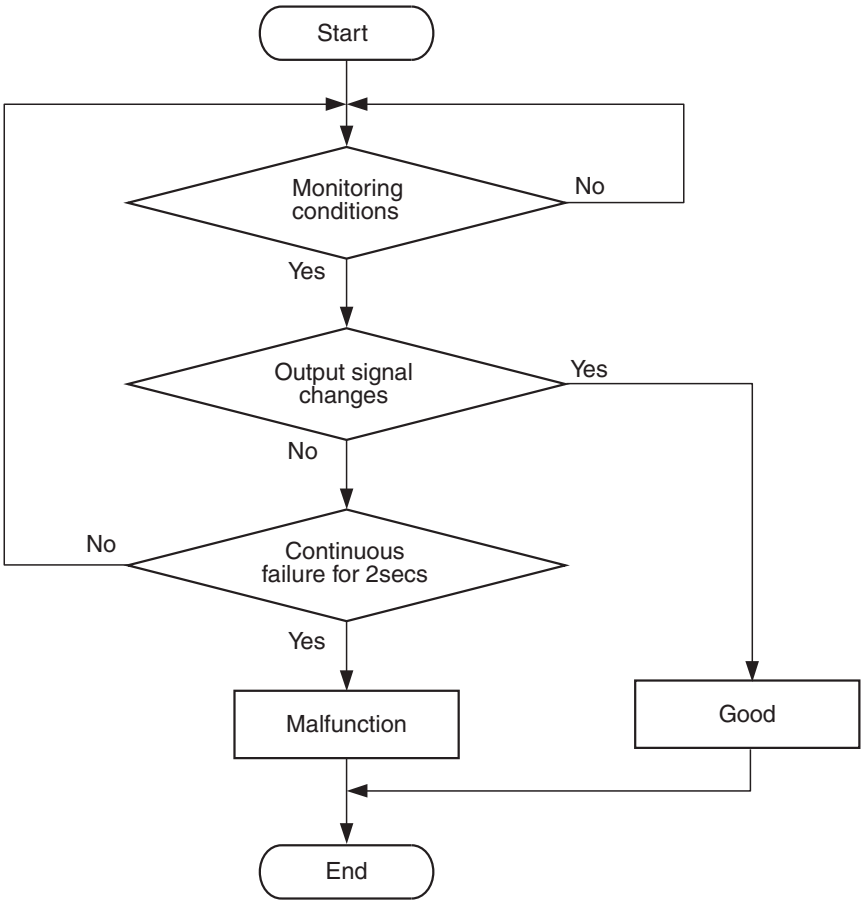
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



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Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Crankshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

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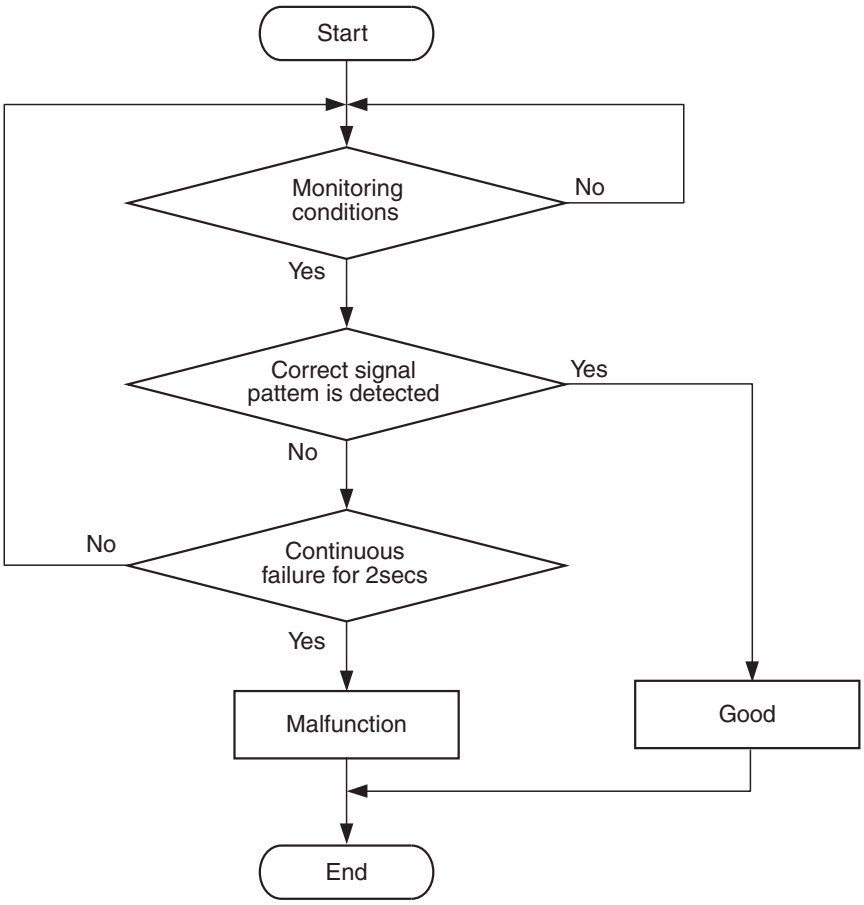
DTC SET CONDITIONS <Range/Performance problem –alignment>

Logic Flow Chart



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Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

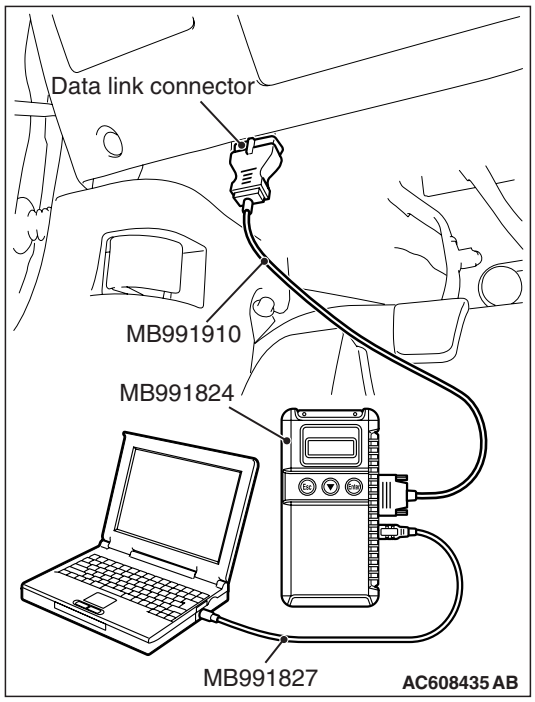
- Crankshaft position sensor failed.
- Open or shorted crankshaft position sensor circuit, or harness damage, or connector damage.
- Crankshaft position sensing ring failed
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

TSB Revision



STEP 1. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

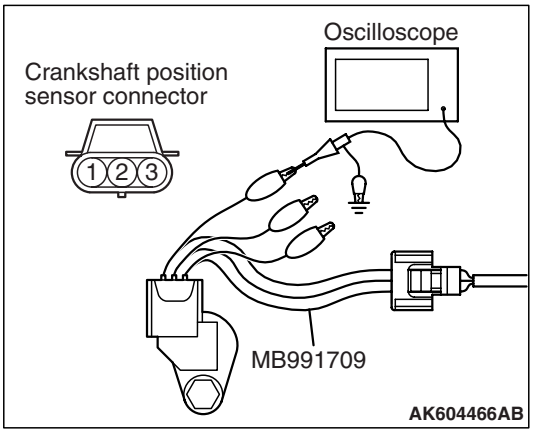
(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.



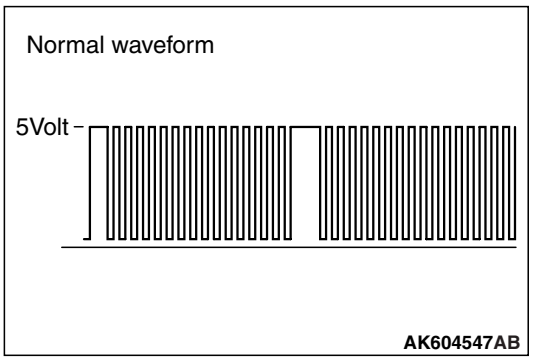
STEP 2. Using the oscilloscope, check the crankshaft position sensor.

(1) Disconnect the crankshaft position sensor connector B-105 and connect the test harness special tool (MB991709) between the separated connectors.

(2) Connect the oscilloscope probe to terminal No. 3 of the crankshaft position sensor connector.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 8.

(3) Start the engine and run at idle.



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

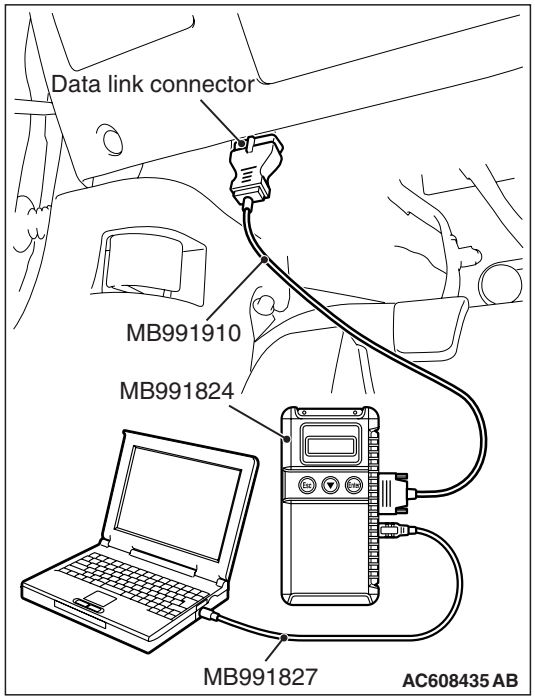
Q: Is the waveform normal?

YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-105 at the crankshaft position sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.



STEP 4. Using scan tool MB991958, check data list item 2: Crankshaft Position Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 2, Crankshaft Position Sensor.
- The tachometer and engine speed indicated on the scan tool should match.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

STEP 5. Check harness connector B-105 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 6. Measure the sensor supply voltage at crankshaft position sensor harness side connector B-105.

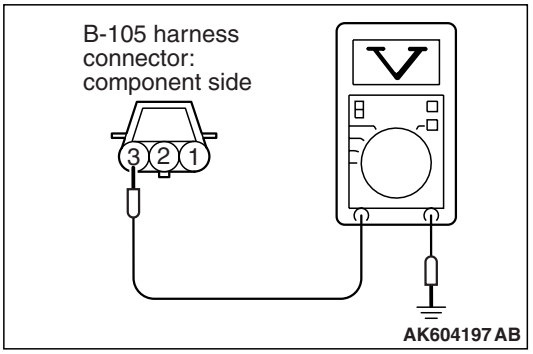
(1) Disconnect the connector B-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 3 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 10.

NO : Go to Step 7.



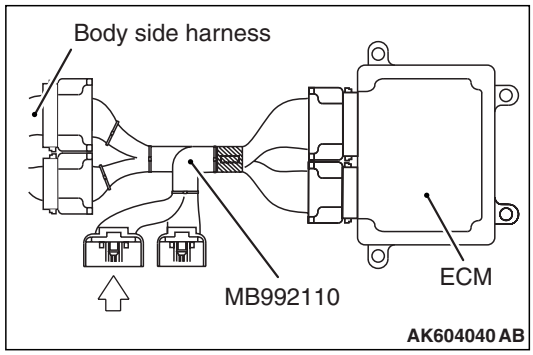
STEP 7. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

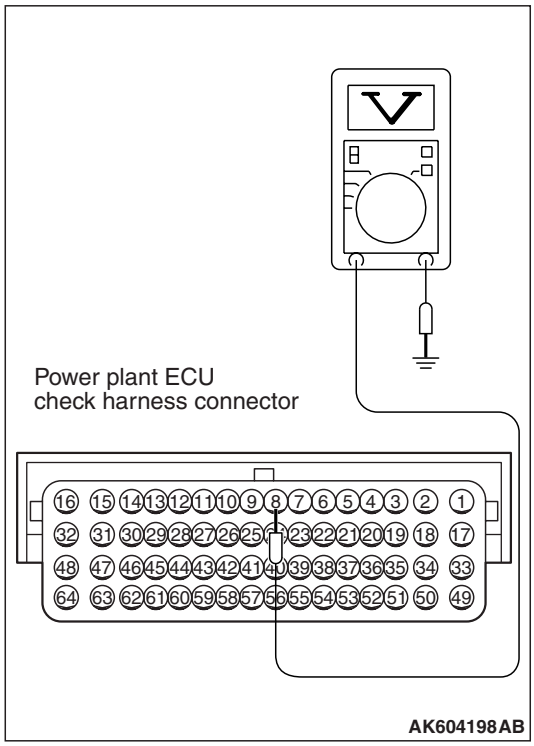
YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 8. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the crankshaft position sensor connector B-105.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 8 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Repair harness wire between crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8) because of open circuit. Then go to Step 20.

NO : Go to Step 9.

STEP 9. Check for short circuit to ground between crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8).

Q: Is the harness wire in good condition?

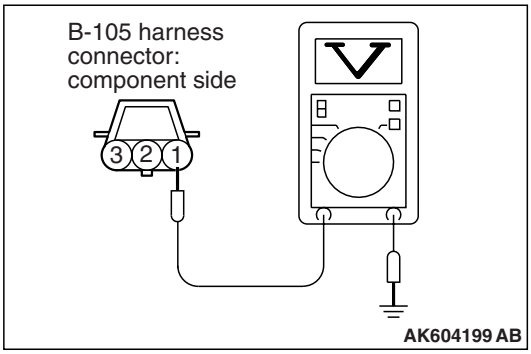
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

NO : Repair it. Then go to Step 20.

STEP 10. Measure the power supply voltage at crankshaft position sensor harness side connector B-105.

(1) Disconnect the connector B-105 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 13.

NO : Go to Step 11.

STEP 11. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.

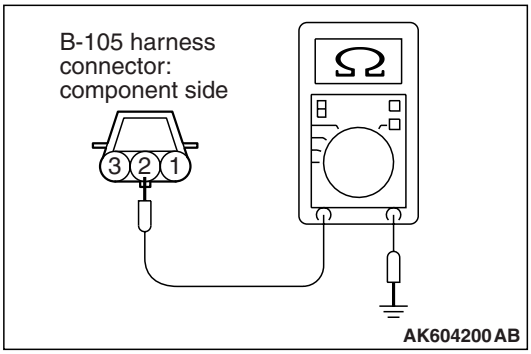
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 12. Check for open circuit and short circuit to ground between crankshaft position sensor connector B-105 (terminal No. 1) and ECM connector B-108 (terminal No. 9).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.

NO : Repair it. Then go to Step 20.



STEP 13. Check the continuity at crankshaft position sensor harness side connector B-105.

(1) Disconnect the connector B-105 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 16.
NO : Go to Step 14.

STEP 14. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 15.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 15. Check for open circuit and harness damage between crankshaft position sensor connector B-105 (terminal No. 2) and ECM connector B-108 (terminal No. 24).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 20.
NO : Repair it. Then go to Step 20.

STEP 16. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 17.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 20.

STEP 17. Check for harness damage between ECM connector B-108 (terminal No. 9) and crankshaft position sensor connector B-105 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 18.
NO : Repair it. Then go to Step 20.

TSB Revision

STEP 18. Check for harness damage between crankshaft position sensor connector B-105 (terminal No. 3) and ECM connector B-108 (terminal No. 8).

Q: Is the harness wire in good condition?

YES : Go to Step 19.
NO : Repair it. Then go to Step 20.

STEP 19. Check the crankshaft position sensing ring.

Q: Is the crankshaft position sensing ring in good condition?

YES : Replace the crankhaft position sensor. Then go to Step 20.
NO : Replace the crankshaft sensing ring. Then go to Step 20.

STEP 20. Test the OBD-II drive cycle.

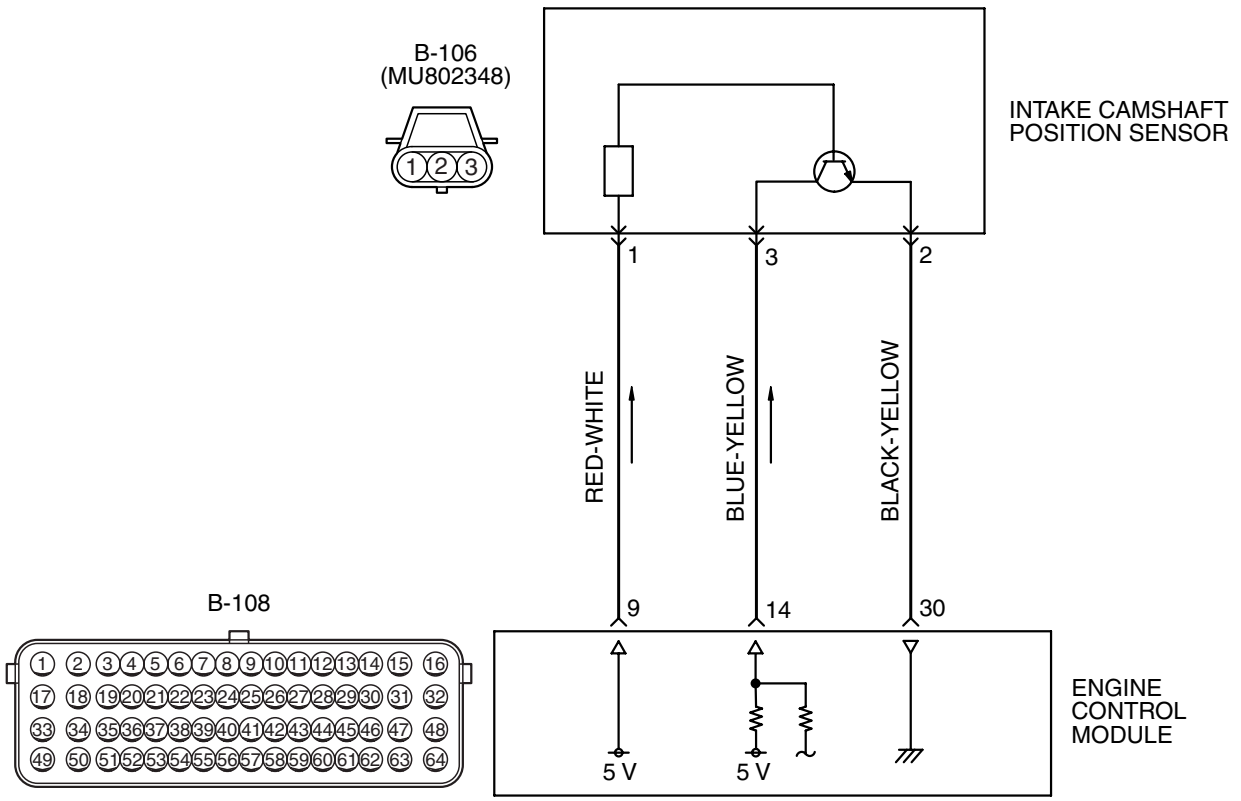
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0335 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0340: Intake Camshaft Position Sensor Circuit

INTAKE CAMSHAFT POSITION SENSOR CIRCUIT



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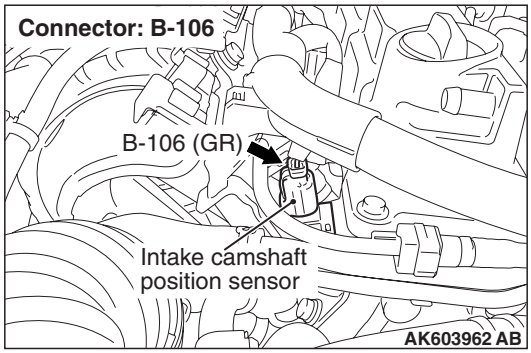
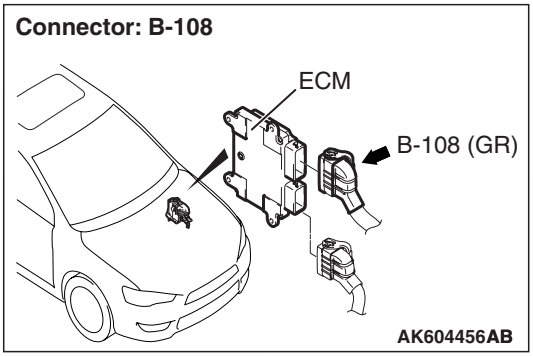




CIRCUIT OPERATION

- The intake camshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the intake camshaft position sensor is grounded with ECM (terminal No. 30).
- A 5-volt voltage is applied on the intake camshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 14). The intake camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TSB Revision

TECHNICAL DESCRIPTION

- The intake camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM.
- When the engine is running, the intake camshaft position sensor outputs a pulse signal.
- The ECM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Intake camshaft position sensor signal does not change.
- Intake camshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

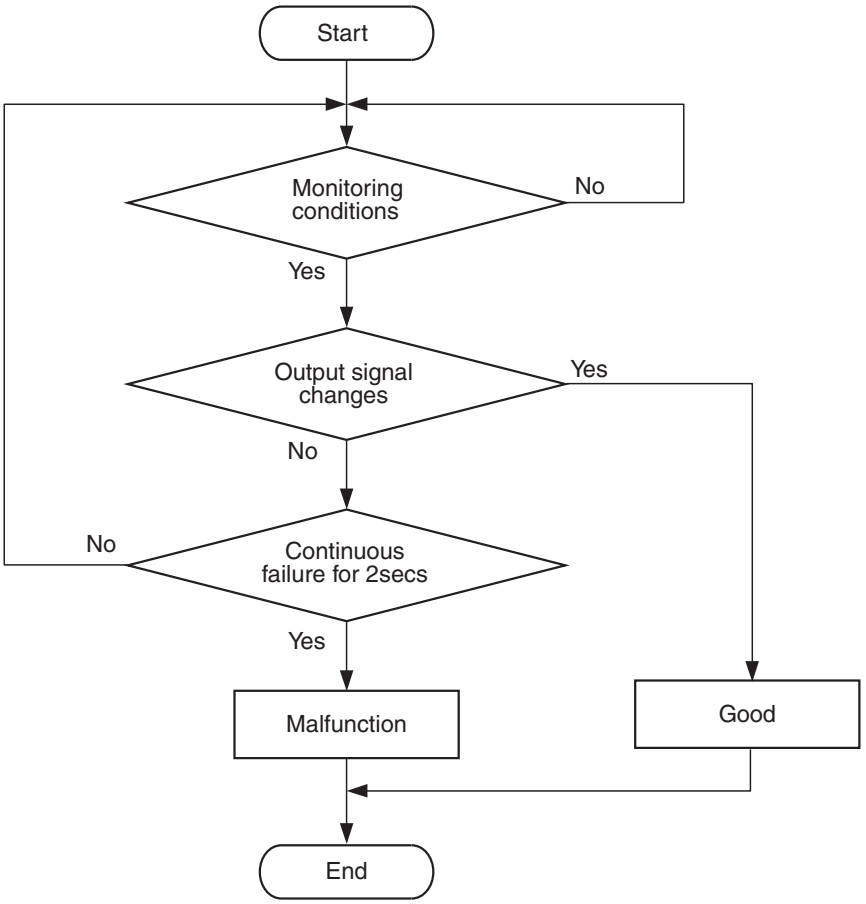
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK604334

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

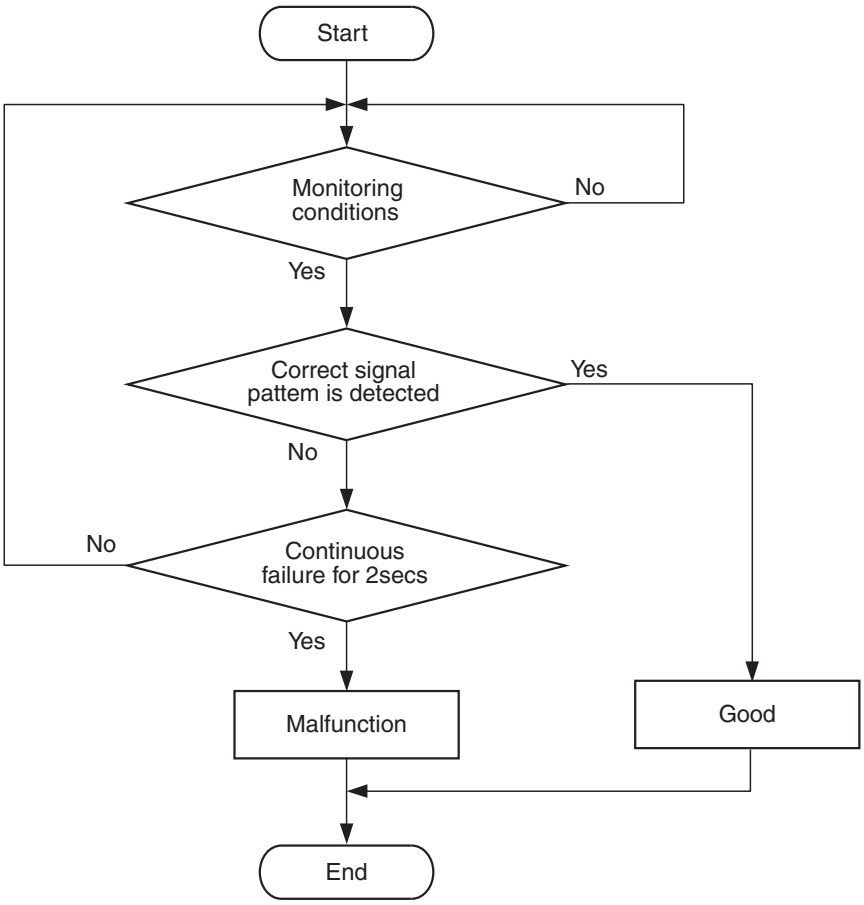
Judgement Criterion

- Intake camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem –alignment>

Logic Flow Chart



AK604335

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and intake camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake camshaft position sensor failed.
- Open or shorted intake camshaft position sensor circuit, or harness damage, or connector damage.
- Intake camshaft failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

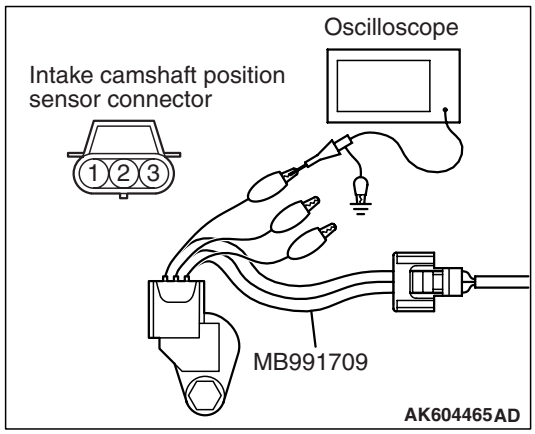
STEP 1. Using the oscilloscope, check the intake camshaft position sensor.

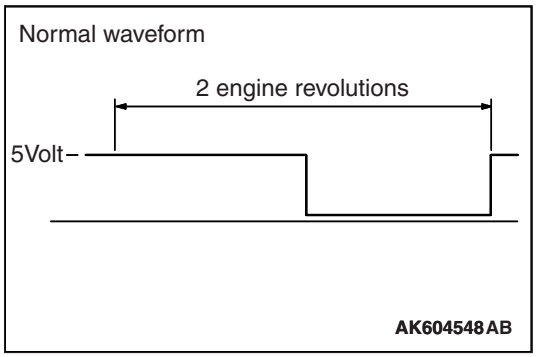
(1) Disconnect the intake camshaft position sensor connector B-106, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the intake camshaft position sensor side connector terminal No. 3.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 14.

(3) Start the engine and run at idle.





(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check harness connector B-106 at intake camshaft position sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0340 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Check harness connector B-106 at intake camshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 5. Measure the sensor supply voltage at intake camshaft position sensor connector B-106.

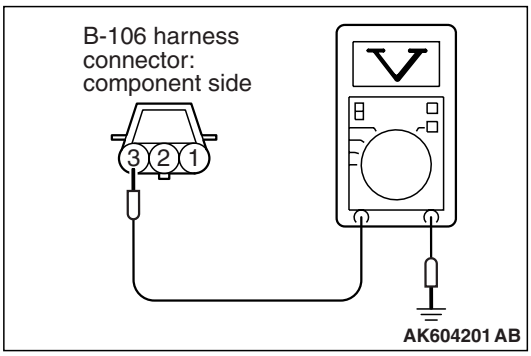
(1) Disconnect the connector B-106 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 3 and ground.

- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 9.

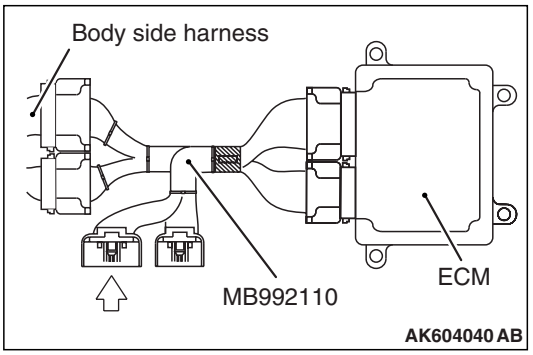
NO : Go to Step 6.

STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

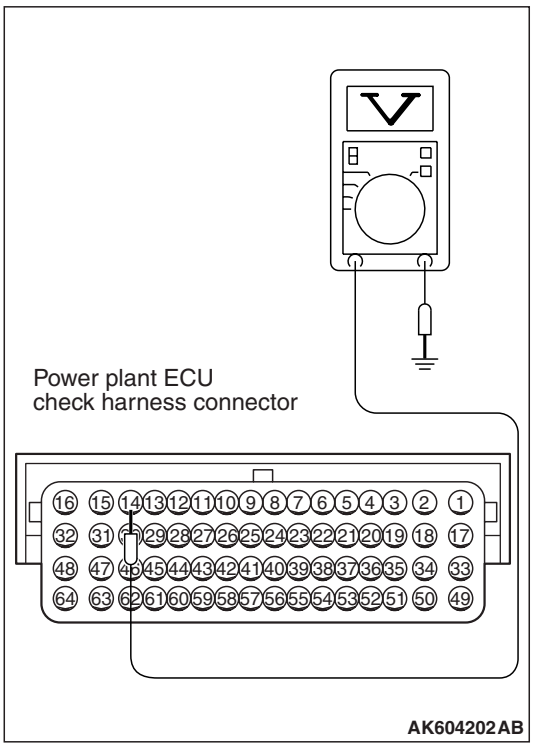
YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.



STEP 7. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect the all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the intake camshaft position sensor connector B-106.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 14 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Repair harness wire between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14) because of open circuit. Then go to Step 19.

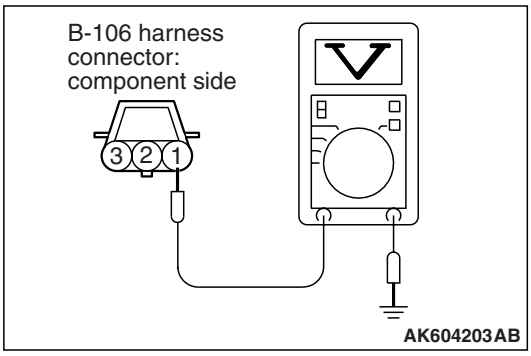
NO : Go to Step 8.

STEP 8. Check for short circuit to ground between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.

NO : Repair it. Then go to Step 19.



STEP 9. Measure the power supply voltage at intake camshaft position sensor connector B-106.

(1) Disconnect the connector B-106 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 11. Check for open circuit and short circuit to ground between intake camshaft position sensor connector B-106 (terminal No. 1) and ECM connector B-108 (terminal No. 9).

Q: Is the harness wire in good condition?

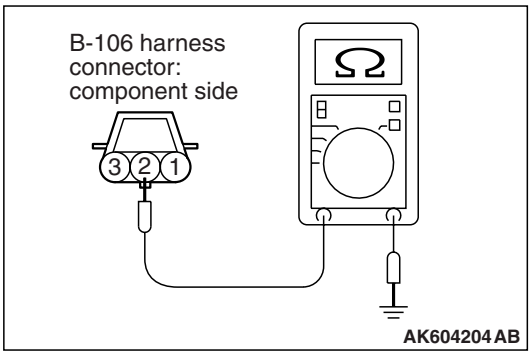
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 12. Check the continuity at intake camshaft position sensor connector B-106.

(1) Disconnect the connector B-106 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 15.
NO : Go to Step 13.



STEP 13. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 14.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 14. Check for open circuit and harness damage between intake camshaft position sensor connector B-106 (terminal No. 2) and ECM connector B-108 (terminal No. 30).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.

NO : Repair it. Then go to Step 19.

STEP 15. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 16. Check for harness damage between ECM connector B-108 (terminal No. 9) and intake camshaft position sensor connector B-106 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to Step 19.

STEP 17. Check for harness damage between intake camshaft position sensor connector B-106 (terminal No. 3) and ECM connector B-108 (terminal No. 14).

Q: Is the harness wire in good condition?

YES : Go to Step 18.

NO : Repair it. Then go to Step 19.

STEP 18. Check the intake camshaft position sensing portion.

Q: Is the intake camshaft position sensing portion in good condition?

YES : Replace the intake camshaft position sensor. Then go to Step 19.

NO : Replace the intake camshaft. Then go to Step 19.

STEP 19. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

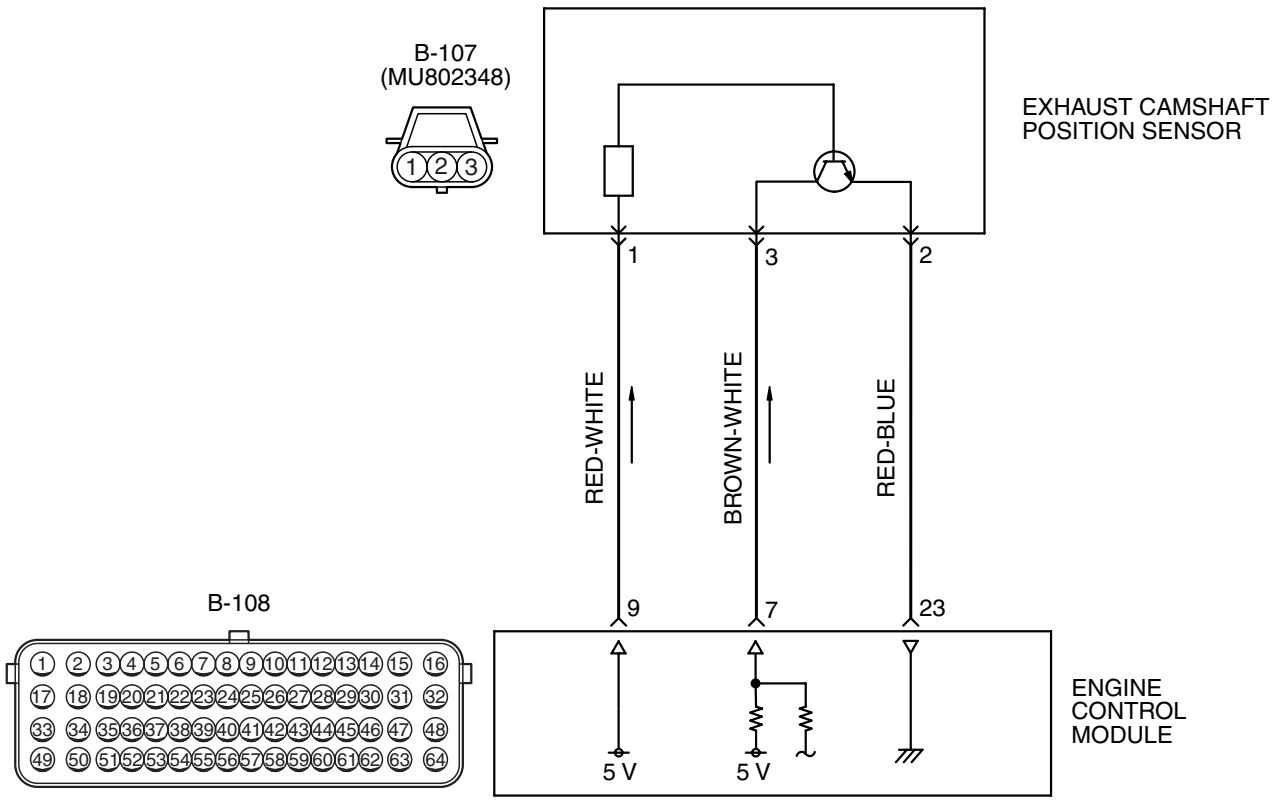
Q: Is DTC P0340 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0365: Exhaust Camshaft Position Sensor Circuit

EXHAUST CAMSHAFT POSITION SENSOR CIRCUIT



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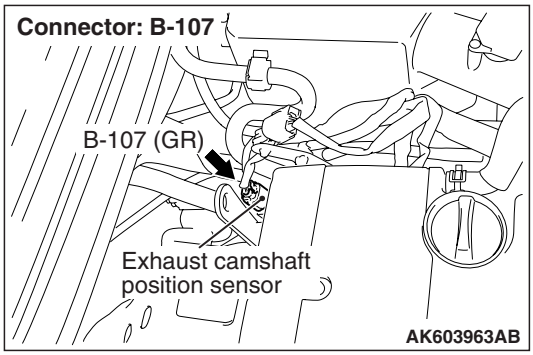
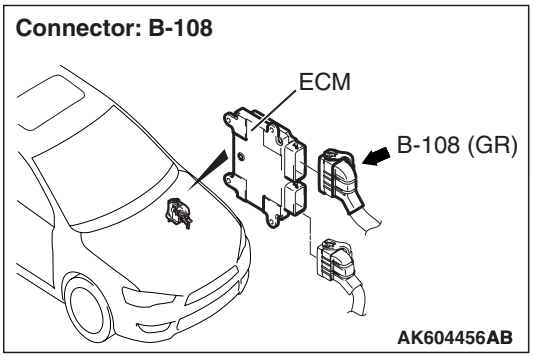




CIRCUIT OPERATION

- The exhaust camshaft position sensor power is supplied from the ECM (terminal No. 9).
- Terminal No. 2 of the exhaust camshaft position sensor is grounded with ECM (terminal No. 23).
- A 5-volt voltage is applied on the exhaust camshaft position sensor output terminal (terminal No. 3) from the ECM (terminal No. 7). The exhaust camshaft position sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The exhaust camshaft position sensor functions to detect the top dead center position of the number 1 cylinder and to convert that data to pulse signals that are input to the ECM.
- When the engine is running, the exhaust camshaft position sensor outputs a pulse signal.
- The ECM checks whether pulse signal is input while the engine is cranking.

DESCRIPTIONS OF MONITOR METHODS

- Exhaust camshaft position sensor signal does not change.
- Exhaust camshaft position sensor signal is not normal pattern.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

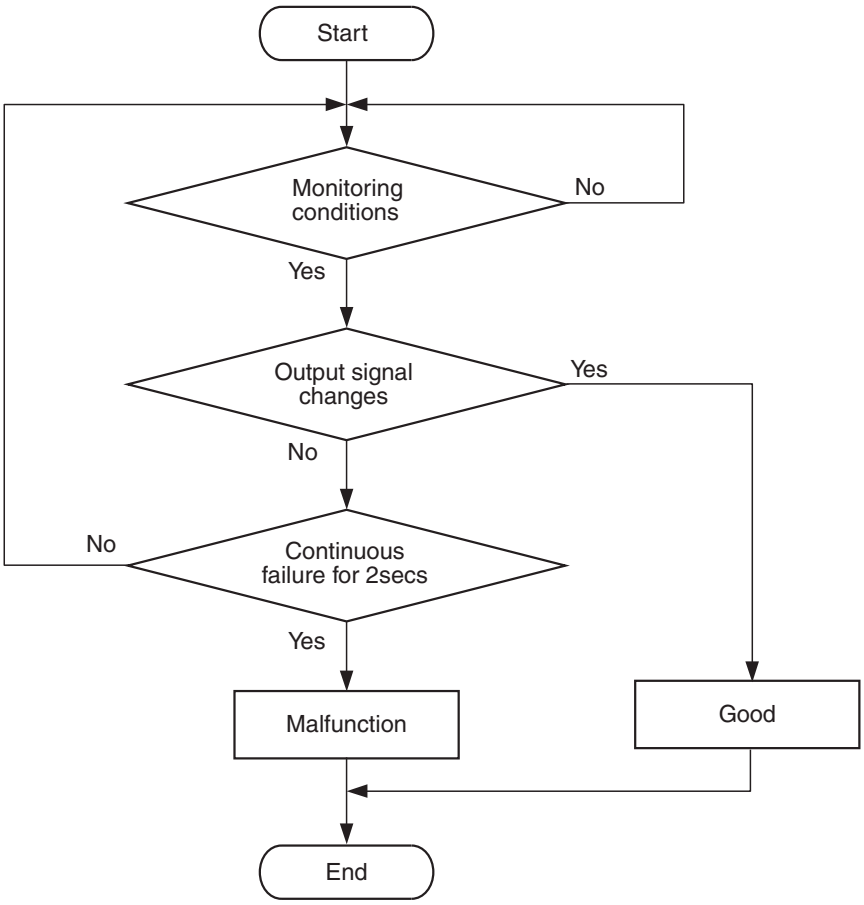
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Circuit continuity>

Logic Flow Chart



AK604334

Check Condition

- Engine is being cranked.

or

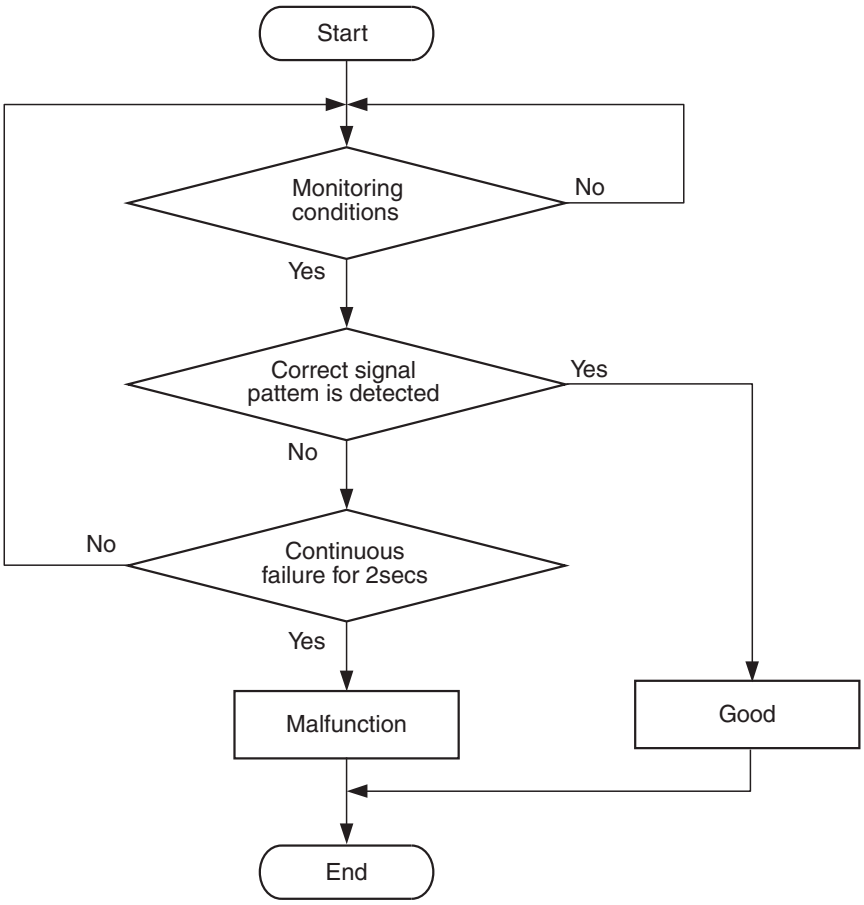
- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Exhaust camshaft position sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

DTC SET CONDITIONS <Range/Performance problem –alignment>

Logic Flow Chart



AK604335

Check Condition

- Engine is being cranked.

or

- Engine speed is higher than 500 r/min excluding during cranking.

Judgement Criterion

- Normal signal pattern has not been input for cylinder identification from the crankshaft position sensor signal and exhaust camshaft position sensor signal for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

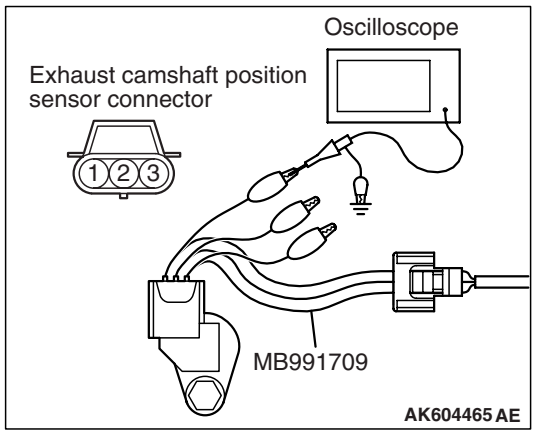
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Exhaust camshaft position sensor failed.
- Open or shorted exhaust camshaft position sensor circuit, or harness damage, or connector damage.
- Exhaust camshaft failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness



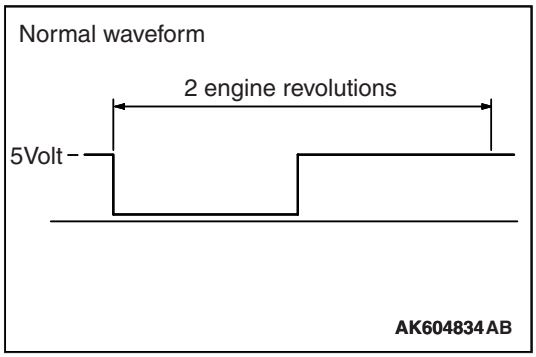
STEP 1. Using the oscilloscope, check the exhaust camshaft position sensor.

(1) Disconnect the exhaust camshaft position sensor connector B-107, and connect test harness special tool (MB991709) between the separated connectors. (All terminals should be connected.)

(2) Connect the oscilloscope probe to the exhaust camshaft position sensor side connector terminal No. 3.

NOTE: When measuring with the ECM side connector, disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors. Then connect the oscilloscope probe to the check harness connector terminal No. 7.

(3) Start the engine and run at idle.



(4) Check the waveform.
- The waveform should show a pattern similar to the illustration.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the waveform normal?

YES : Go to Step 2.
NO : Go to Step 4.

STEP 2. Check harness connector B-107 at exhaust camshaft position sensor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0365 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Check harness connector B-107 at exhaust camshaft position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 5. Measure the sensor supply voltage at exhaust camshaft position sensor connector B-107.

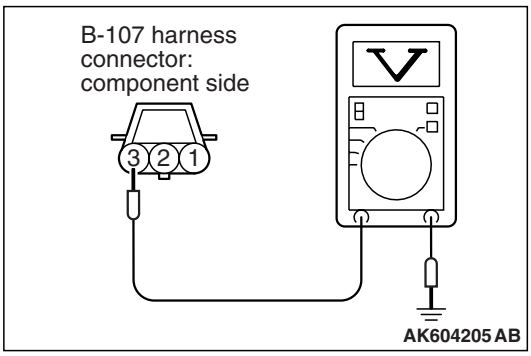
(1) Disconnect the connector B-107 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 3 and ground.

- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 9.

NO : Go to Step 6.

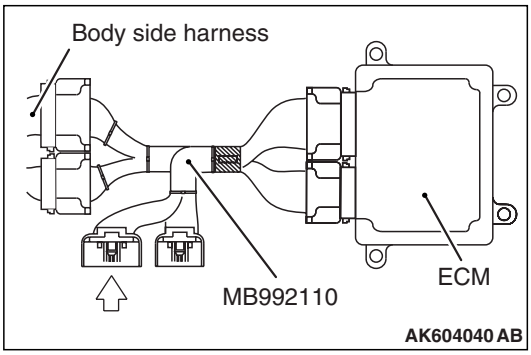
STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

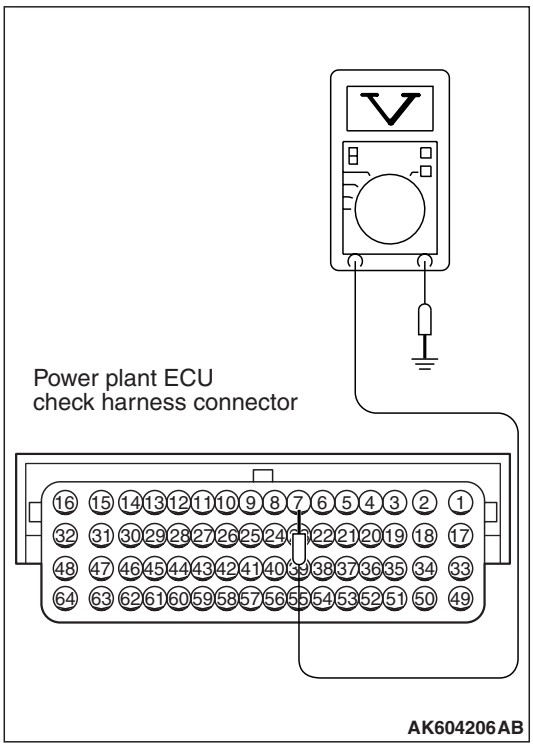
YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 7. Measure the sensor supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect the all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the exhaust camshaft position sensor connector B-107.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 7 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Repair harness wire between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7) because of open circuit. Then go to Step 19.

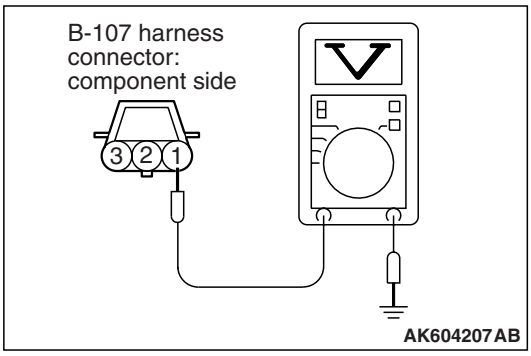
NO : Go to Step 8.

STEP 8. Check for short circuit to ground between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.

NO : Repair it. Then go to Step 19.



STEP 9. Measure the power supply voltage at exhaust camshaft position sensor connector B-107.

(1) Disconnect the connector B-107 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 12.
NO : Go to Step 10.

STEP 10. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 11. Check for open circuit and short circuit to ground between exhaust camshaft position sensor connector B-107 (terminal No. 1) and ECM connector B-108 (terminal No. 9).

Q: Is the harness wire in good condition?

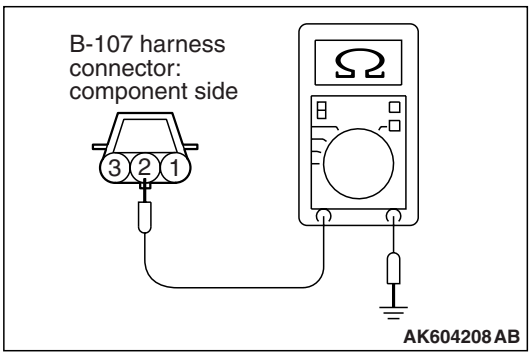
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 12. Check the continuity at exhaust camshaft position sensor connector B-107.

(1) Disconnect the connector B-107 and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less).

Q: Does continuity exist?

YES : Go to Step 15.
NO : Go to Step 13.



STEP 13. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 14. Check for open circuit and harness damage between exhaust camshaft position sensor connector B-107 (terminal No. 2) and ECM connector B-108 (terminal No. 23).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 19.
NO : Repair it. Then go to Step 19.

STEP 15. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 16.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 19.

STEP 16. Check for harness damage between ECM connector B-108 (terminal No. 9) and exhaust camshaft position sensor connector B-107 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 17.
NO : Repair it. Then go to Step 19.

STEP 17. Check for harness damage between exhaust camshaft position sensor connector B-107 (terminal No. 3) and ECM connector B-108 (terminal No. 7).

Q: Is the harness wire in good condition?

YES : Go to Step 18.
NO : Repair it. Then go to Step 19.

STEP 18. Check the exhaust camshaft position sensing portion.

Q: Is the exhaust camshaft position sensing portion in good condition?

YES : Replace the exhaust camshaft position sensor. Then go to Step 19.
NO : Replace the exhaust camshaft. Then go to Step 19.

STEP 19. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0365 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0401: Exhaust Gas Recirculation Flow Insufficient Detected <California>

TECHNICAL DESCRIPTION

- When the EGR valve (stepper motor) is actuated from the fully closed position toward the open position while the engine is running, EGR gas flows.
- The ECM checks how the EGR gas flow signal changes.

DESCRIPTIONS OF MONITOR METHODS

Small manifold pressure change during exhaust gas recirculation (EGR) operation from closed to open.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

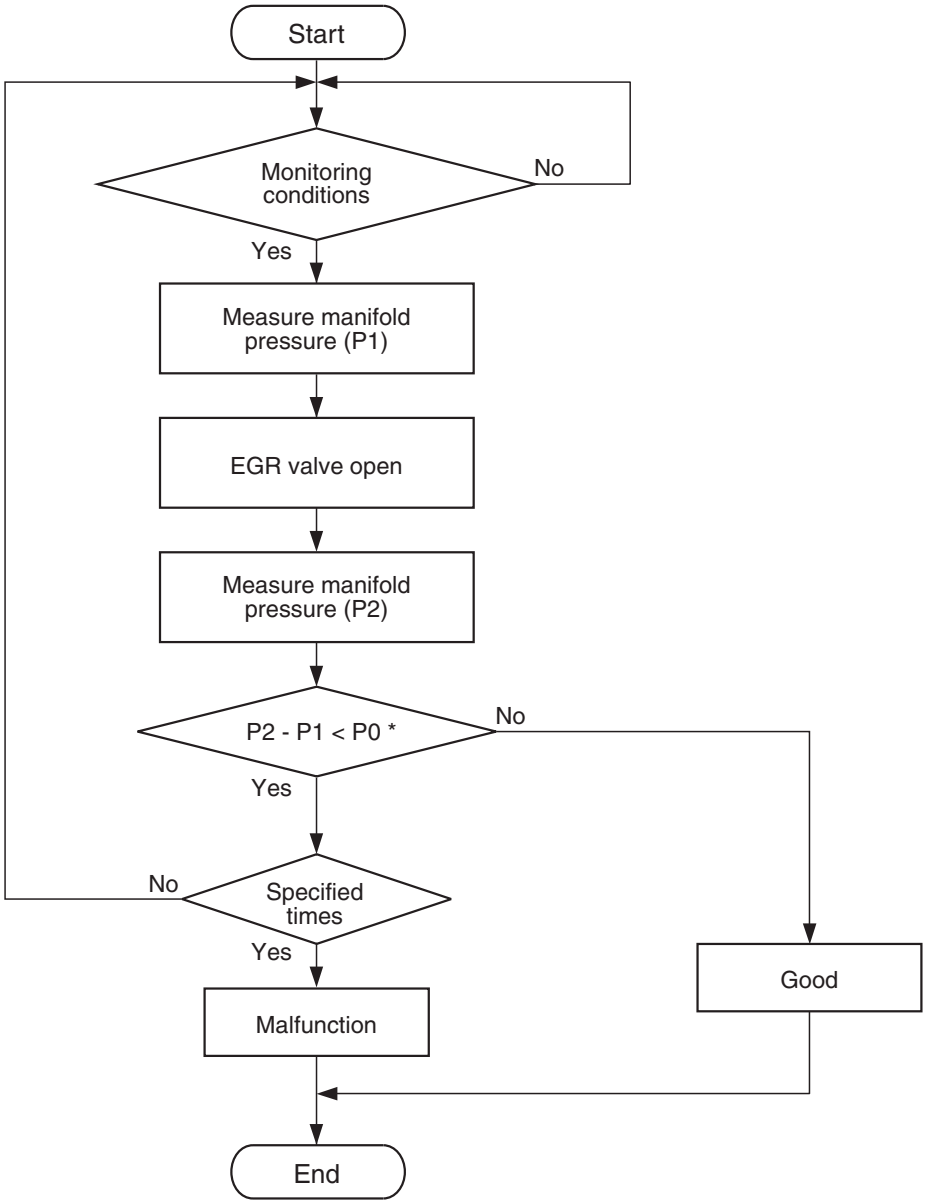
- EGR stepper motor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



∗ P0 : Threshold value

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Check Conditions

- At least 20 seconds have passed since the last monitor was complete.
- Engine coolant temperature is higher than 76° C (169° F).
- Engine speed is at between 1,250 and 2,500 r/min <M/T> or 1,188 and 2,500 r/min <CVT>.
- Intake air temperature is higher than −10° C (14° F).
- Volumetric efficiency is lower than 20 percent
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Fuel is being shut off.
- Vehicle speed is 30 km/h (19 mph) or more.
- At least 90 seconds have passed since manifold absolute pressure sensor output voltage fluctuated 1.5 volts or more.
- Battery positive voltage is higher than 10.3 volts.
- Accelerator pedal is closed.

<M/T> or 24 percent <CVT>.

TSB Revision

- The ECM monitors for this condition for 3 cycles of 1.8 seconds each during the drive cycle.

Judgement Criterion

- When the EGR valve opens to the prescribed opening, when intake manifold pressure fluctuation width is lower than 2.5 kPa (0.74 in.Hg).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Contaminated EGR valve and EGR passage.
- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, or connector damage.
- Manifold absolute pressure sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check the EGR system

Refer to GROUP 17, Emission Control System –Exhaust Gas Recirculation (EGR) System –General Information <California> P.17-81.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 3.
NO : Go to Step 2.

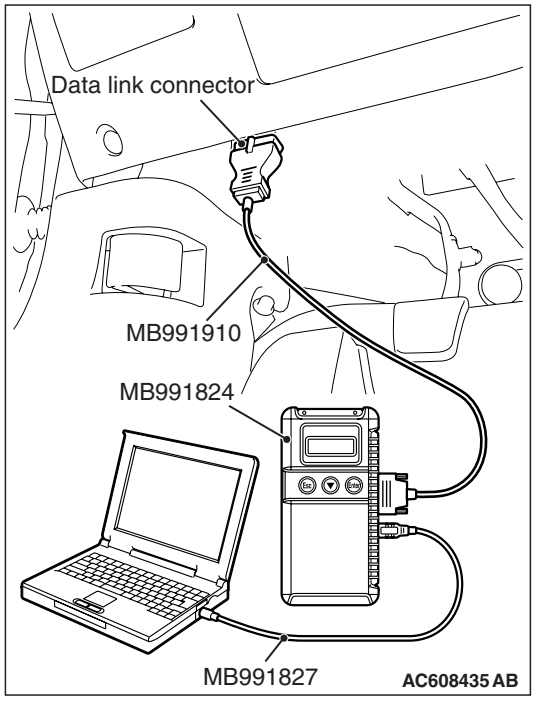
STEP 2. Using scan tool MB991958, check data list item 8: Manifold Absolute Pressure Sensor.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 8, Manifold Absolute Pressure Sensor.
(4) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - Should be between 16 –36 kPa (4.7 –10.6 in.Hg) at engine idling.
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Clean the EGR valve and EGR passage. Then go to Step 3.
NO : Refer to DTC P0106 –Manifold Absolute Pressure Sensor Circuit Range/Performance Problem P.13A-149, DTC P0107 –Manifold Absolute Pressure Sensor Circuit Low Input P.13A-158, DTC P0108 – Manifold Absolute Pressure Sensor Circuit High Input P.13A-166.



STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 3 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0401 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0420: Warm Up Catalyst Efficiency Below Threshold <Except for California>

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

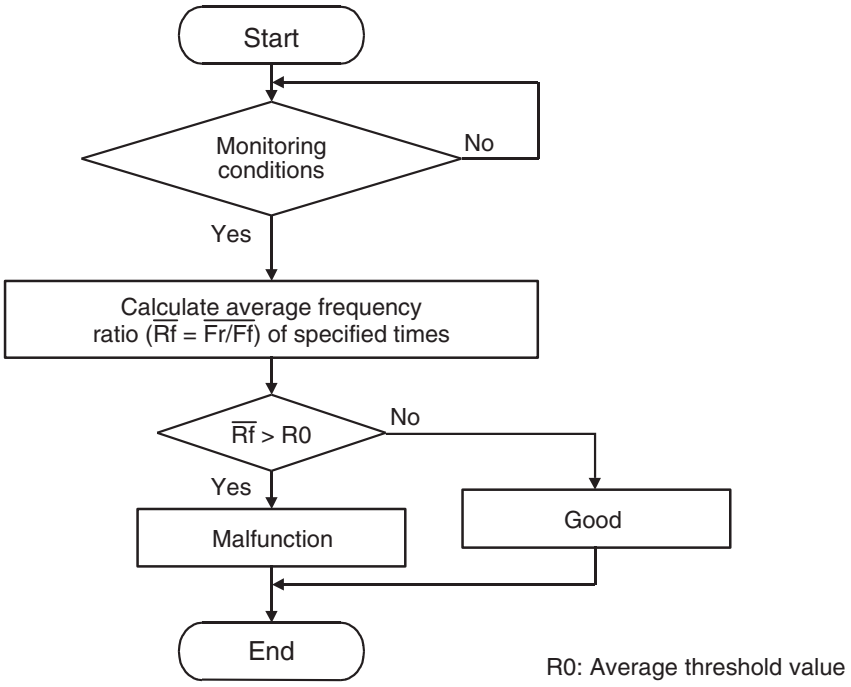
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is lower than 3,500 r/min <M/T> or 3,000 r/min <CVT>.
- Accelerator pedal is open.
- Mass airflow is between 12 and 45 g/sec <M/T> or 9 and 45 g/sec <CVT>.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The ECM monitors for this condition for 5 cycles <M/T> or 3 cycles <CVT> of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion

- When the monitoring for 10 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 4 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Replace the catalytic converter.

(1) Replace the catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0420 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : The inspection is complete.

DTC P0421: Warm Up Catalyst Efficiency Below Threshold <California>

TECHNICAL DESCRIPTION

- The signal from the rear heated oxygen sensor differs from the front heated oxygen sensor, because the catalytic converter purifies exhaust gas. When the catalytic converter has deteriorated, the signal from the front heated oxygen sensor becomes similar to the rear heated oxygen sensor.
- The ECM compares the output of the front and rear heated oxygen sensor signals.

DESCRIPTIONS OF MONITOR METHODS

Front and rear heated oxygen sensor rich/lean switching frequencies are nearly equal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

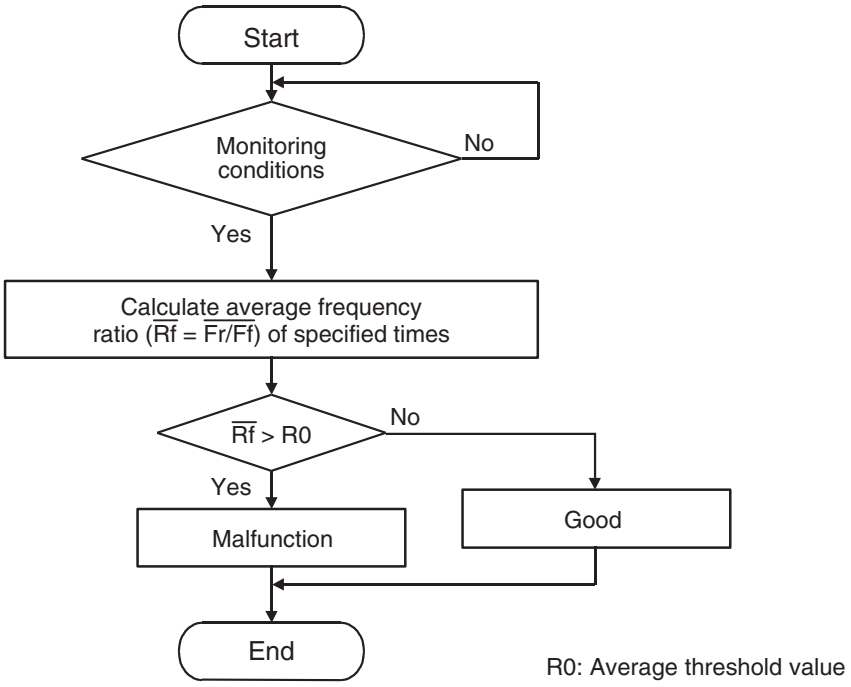
- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor inactive (front) monitor
- Heated oxygen sensor offset voltage monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is lower than 3,500 r/min <M/T> or 3,000 r/min <CVT>.
- Accelerator pedal is open.
- Mass airflow is between 13 and 45 g/sec <M/T> or 9 and 45 g/sec <CVT>.
- More than 3 seconds have elapsed after the above-mentioned three conditions have been met.
- Intake air temperature is higher than –10° C (14° F).
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Under the closed loop air/fuel ratio control.
- Vehicle speed is 1.5 km/h (1.0 mph) or more.
- The ECM monitors for this condition for 5 cycles <M/T> or 3 cycles <CVT> of 10 seconds each during the drive cycle.
- Short-term fuel trim is higher than –25 percent and lower than +25 percent.
- The cumulative mass airflow is higher than 1,638 g.

Judgement Criterion

- When the monitoring for 10 seconds is carried out 5 times, the frequency ratio of rear and front is 0.7 or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 4 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Catalytic converter deteriorated.
- Heated oxygen sensor failed.
- Exhaust leak.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Replace the catalytic converter.

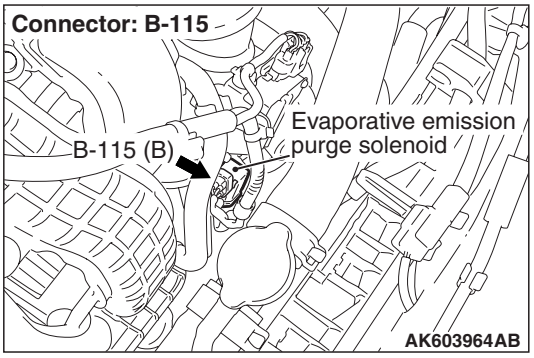
(1) Replace the catalytic converter.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 4 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

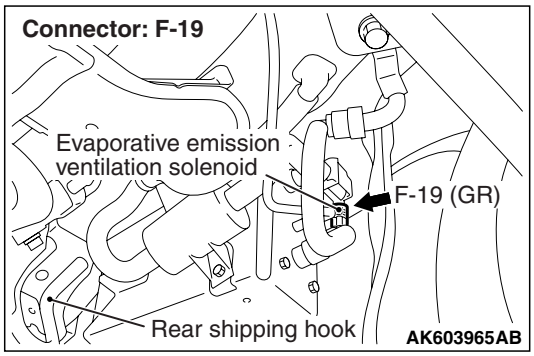
Q: Is DTC P0421 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : The inspection is complete.

DTC P0441: Evaporative Emission Control System Incorrect Purge Flow





TECHNICAL DESCRIPTION

- ECM detects a stuck open condition of evaporative emission purge solenoid and a stuck closed condition of evaporative emission ventilation solenoid by pressure change in fuel tank.
- Stuck open evaporative emission purge solenoid is judged through monitoring leak of evaporative emission system.
- Stuck closed evaporative emission ventilation solenoid is judged after 20 seconds from end of monitoring leak of evaporative emission system, or of usual operation of evaporative emission purge solenoid from ON to OFF.

DESCRIPTIONS OF MONITOR METHODS

Fuel tank pressure decreases largely during purge-cut.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

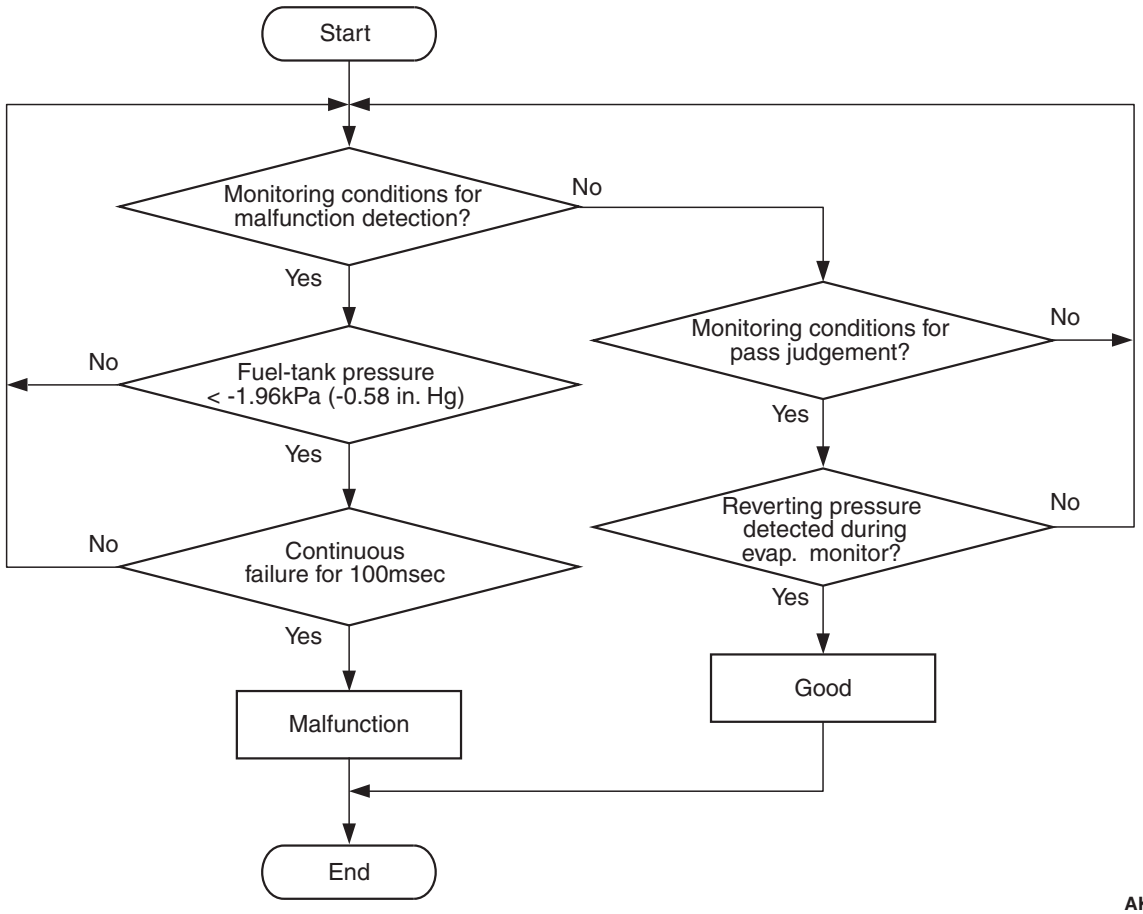
- Fuel tank pressure sensor monitor

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine is running.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- 20 seconds have elapsed since the duty cycle of the evaporative emission purge solenoid has turned to 0 percent.

Judgement Criterion

- The pressure in the fuel tank is −1.96 kPa (−0.58 in.Hg) or less for 0.1 second.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-10.

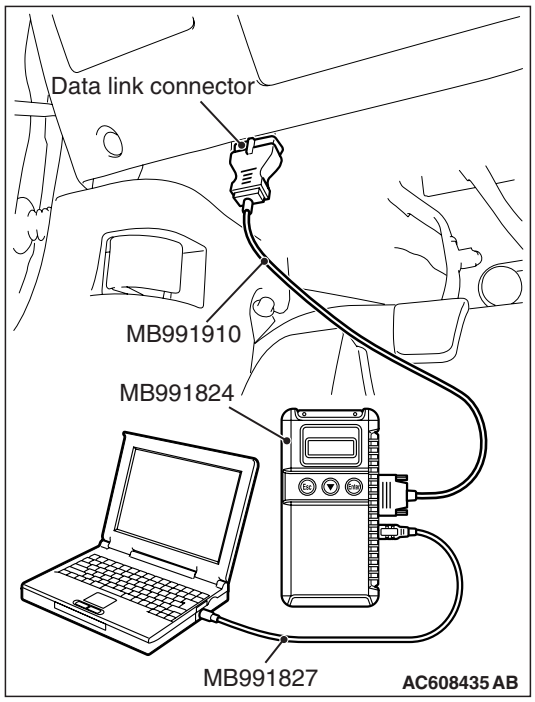
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Evaporative emission ventilation solenoid failed.
- Fuel tank differential pressure sensor circuit related part(s) failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0451 set?

YES : Refer to DTC P0451 –Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-523.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

(1) Turn the ignition switch to the "ON" position.
(2) Remove the fuel cap.
(3) Set scan tool MB991958 to the data reading mode for item 52, Fuel Tank Differential Pressure Sensor.
- The fuel tank differential pressures should be 1,500 and 3,500 millivolts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the fuel tank pressure between 1,500 and 3,500 millivolts?

YES : Go to Step 3.
NO : Refer to DTC P0451 –Evaporative Emission Control System Pressure Sensor Range/Performance P.13A-523.

STEP 3. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 5.

STEP 4. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
- An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : Repair or replace the vent hose and air filter. Then go to Step 5.
NO : Replace the evaporative emission ventilation solenoid. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

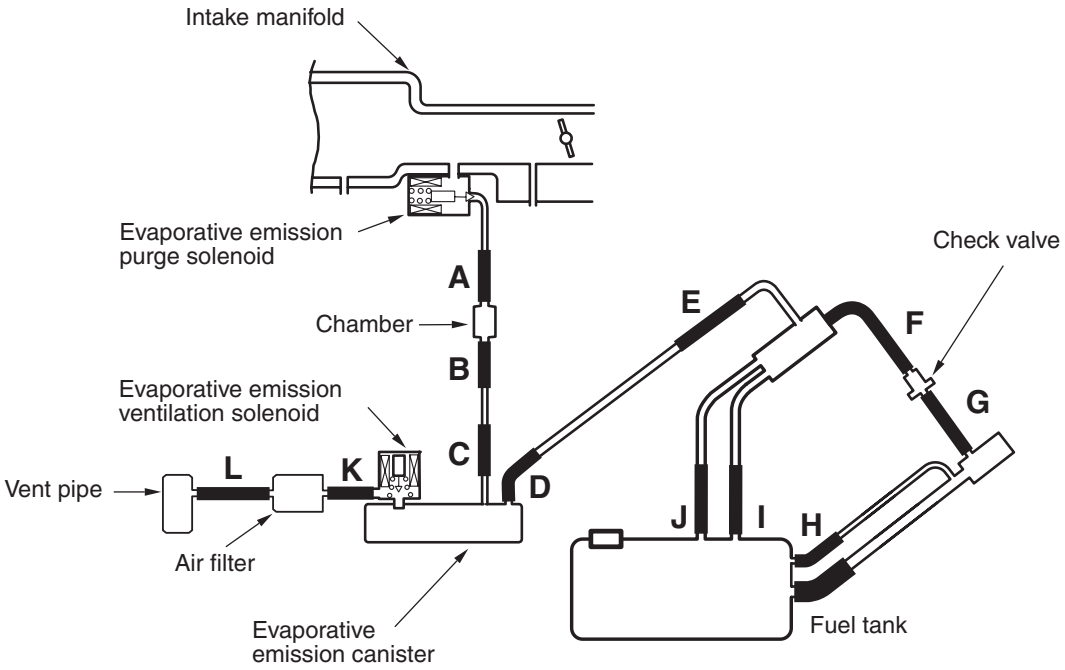
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-10.
(2) Read the diagnostic trouble code.

Q: Is DTC P0441 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0442: Evaporative Emission System Leak Detected (Small Leak)

System diagram



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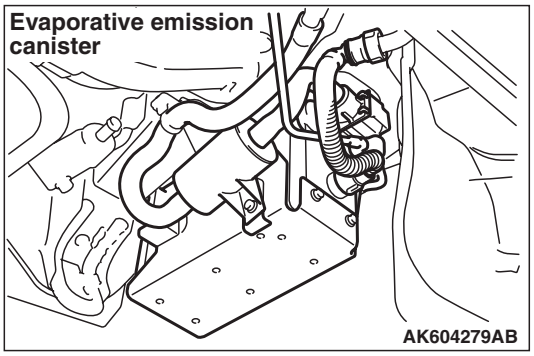

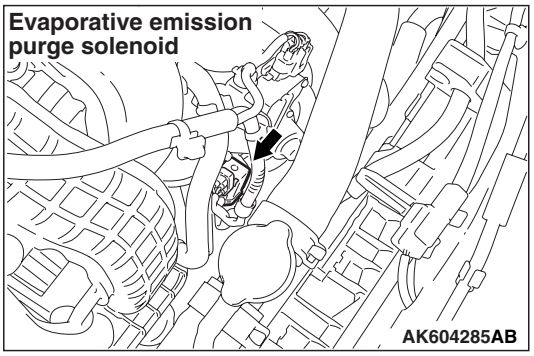

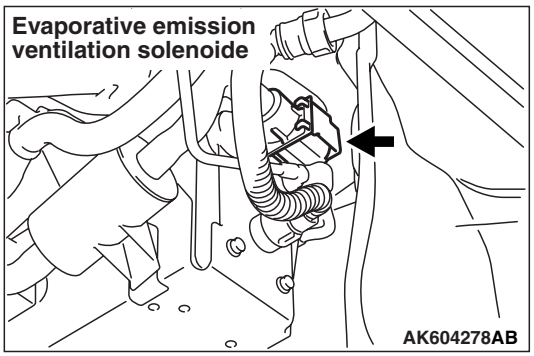

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TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.
- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DESCRIPTIONS OF MONITOR METHODS

- Measure reverting pressure after depressurizing by intake manifold negative pressure and detect malfunction if reverting pressure rises largely.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

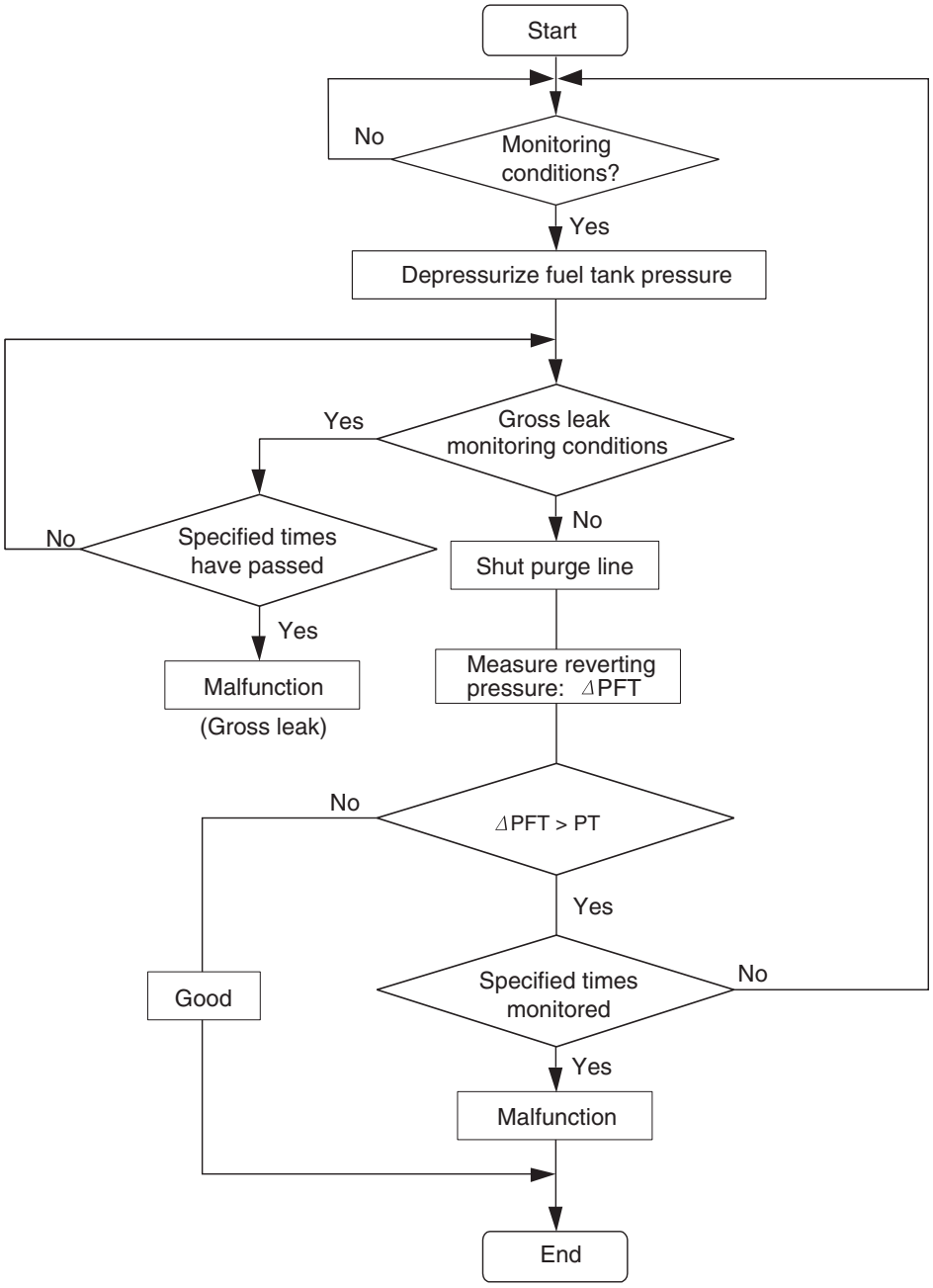
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

Remaining fuel amount is 15 –40 percent of capacity.

Conditions A: At Start up

- Intake air temperature is 36° C (97° F) or less when the engine is started.
- The engine coolant temperature is 36 ° C (97 ° F) or less when the engine is started.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Conditions B: For Test to Run

- The fuel temperature is less than 36 ° C (97 ° F), and less than 13 minutes have elapsed since the engine was started.
- Engine coolant temperature is greater than 60° C (140° F)
- Power steering switch: "OFF"
- Barometric pressure is greater than 76 kPa (11 psi).

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- Vehicle speed is greater than 20 km/h (12.4 mph).

Conditions C: For Test to Stop

- Intake air temperature is greater than –10° C (14° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 451 Pa (0.065 psi).
- The pressure fluctuation is less than 647 Pa (0.094 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 75 –125 seconds.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 1,172 Pa (0.170 psi) in 20 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (75 –125 seconds) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

Check Conditions

Remaining fuel amount is 40 –85 percent of capacity.

Conditions A: At Start up

- Intake air temperature is less than 36 ° C (97 ° F) when the engine is started.
- The engine coolant temperature is less than 36 ° C (97 ° F) when the engine is started.

Conditions B: For Test to Run

- The fuel temperature is less than 36 ° C (97 ° F).
- Barometric pressure is greater than 76 kPa (11 psi).
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Conditions C: For Test to Stop

- Intake air temperature is greater than –10 ° C (14° F).
- Engine coolant temperature is greater than 20 ° C (68 ° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed since the start of the previous monitoring.
- Monitoring time: 10 –14 minutes.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 1,922 Pa (0.279 psi) in 128 seconds after the tank and vapor line were closed.

  NOTE: The monitoring time (10 –14 minutes) depends on the fuel level and the temperature in the fuel tank.
  The next monitoring occurs at least 10 seconds later.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-10.

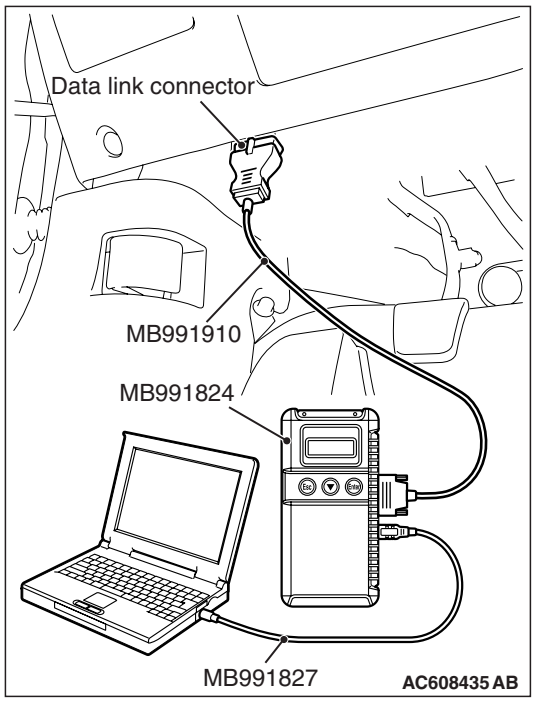
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Evaporative emission canister seal is leaking.
- Fuel tank, purge line or vapor line seal is leaking.
- Evaporative emission ventilation solenoid does not seal.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

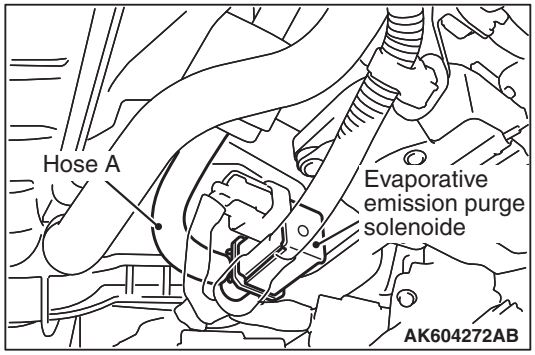
YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-46. If no other DTC's have been set, go to Step 2 .

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1 .

STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

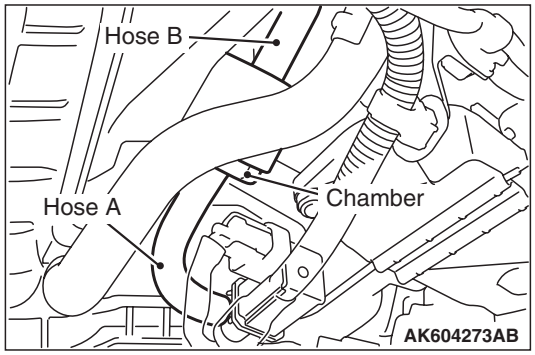


Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3 .
NO : Replace the evaporative emission purge solenoid. Then go to Step 14 .

STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

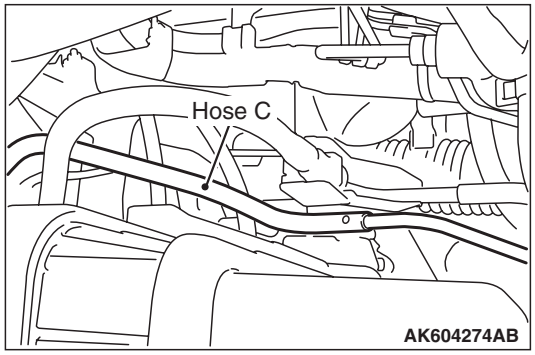


Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4 .
NO : Replace the any damaged hose or chamber. Then go to Step 14 .

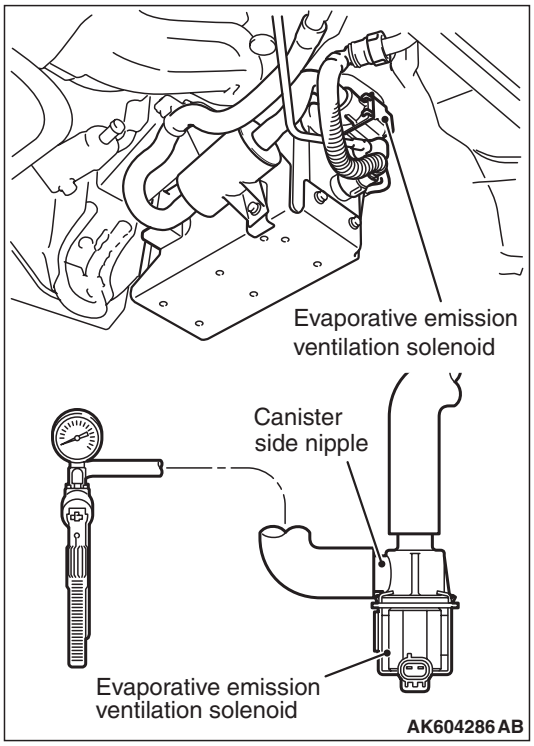
STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.



Q: Does hose C hold vacuum?

YES : Go to Step 5 .
NO : Replace the any damaged hose or chamber. Then go to Step 14 .



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

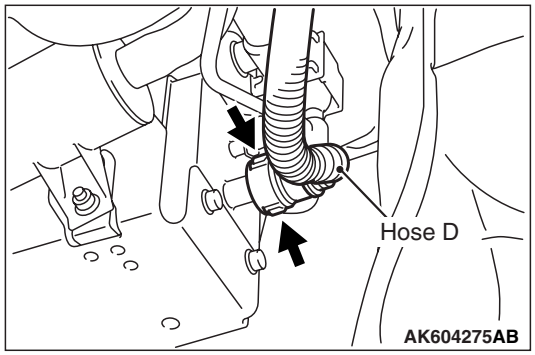
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

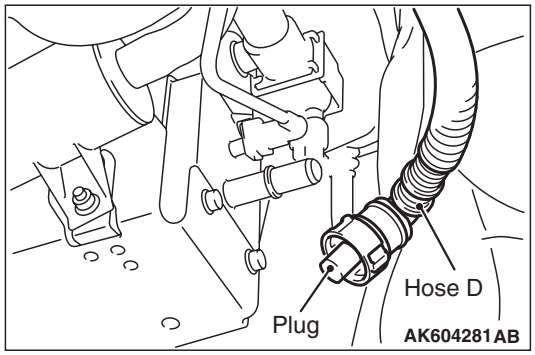
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6 .
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-87).Then go to Step 14 .

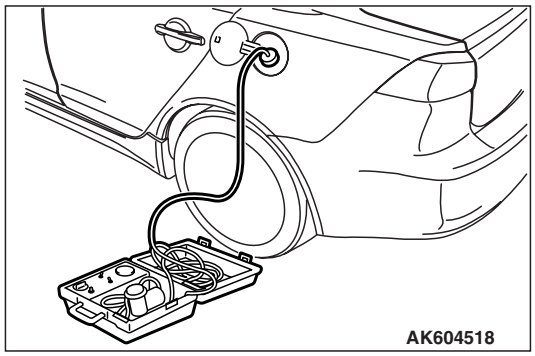
STEP 6. Pressure test the evaporative emission system lines from hoses D to J.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose D.
(3) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(4) Remove the fuel cap.



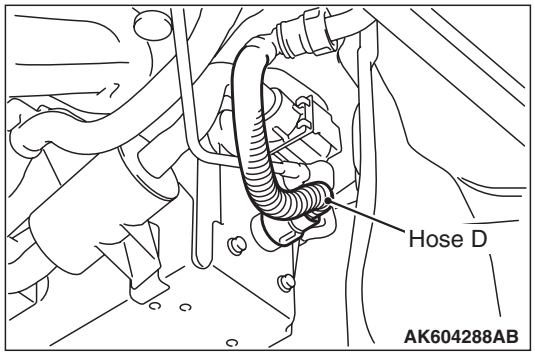
(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) Pressure test the system to determine whether any leaks are present.

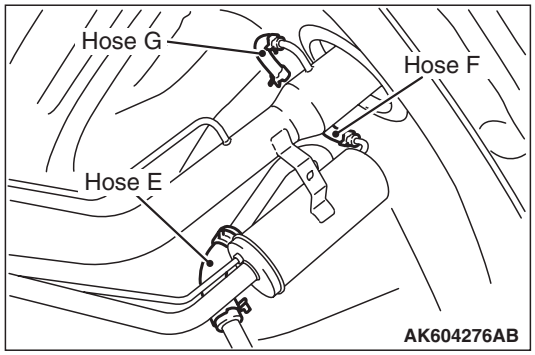
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 12 .
NO : Go to Step 7 .





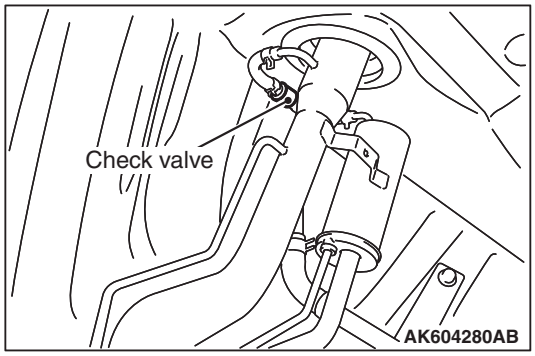
STEP 7. Check for leaks in evaporative emission hoses D through G.

Use a hand vacuum pump to test each hose from hose D to hose G.

Q: Do the hoses hold vacuum?

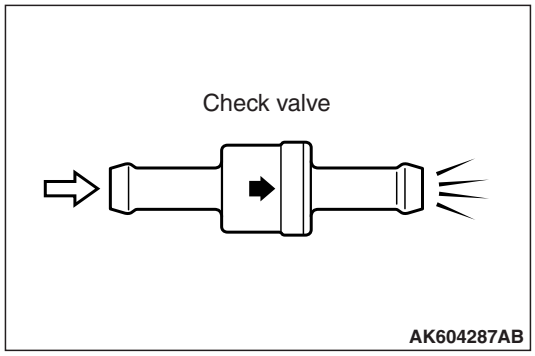
YES : Go to Step 8 .

NO : Replace any damaged hose. Then go to Step 14 .



STEP 8. Test check valve.

(1) Check valve is a one-way check valve.

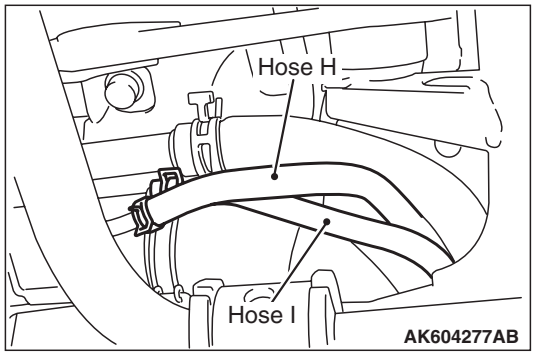


(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 9.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



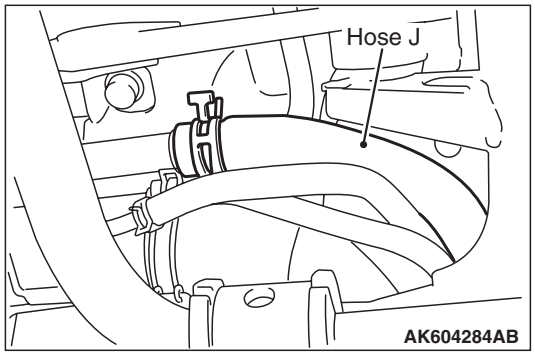
STEP 9. Check for leaks in evaporative emission hoses H and I.

Use a hand vacuum pump to test each hose H and I.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

NO : Replace any damaged hose. Then go to Step 14 .



STEP 10. Check for leaks in evaporative emission hose J.

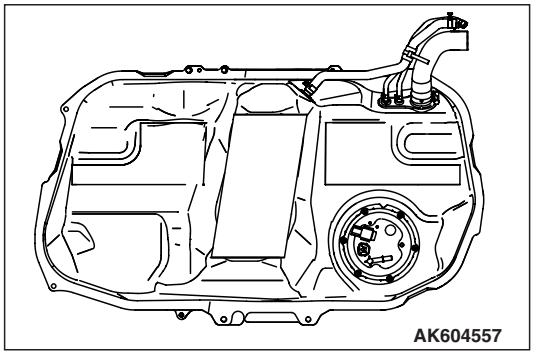
(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9).

(2) Use the hand vacuum pump to check hose J.

Q: Does the hose hold vacuum?

YES : Go to Step 11.

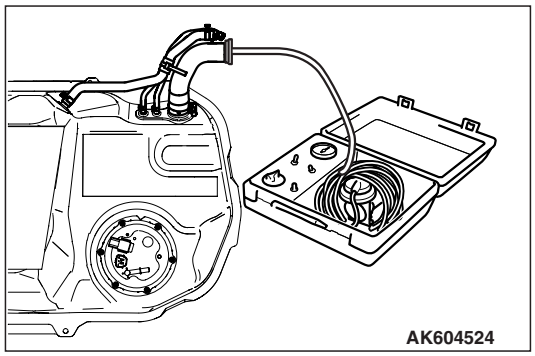
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



STEP 11. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.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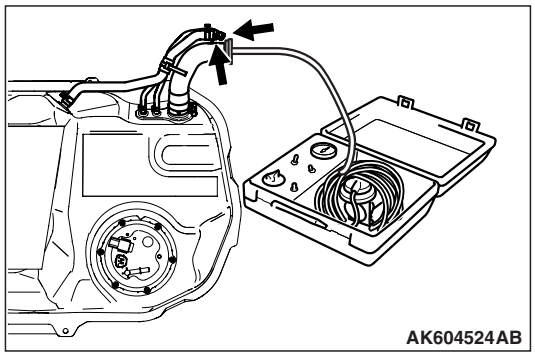
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.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(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

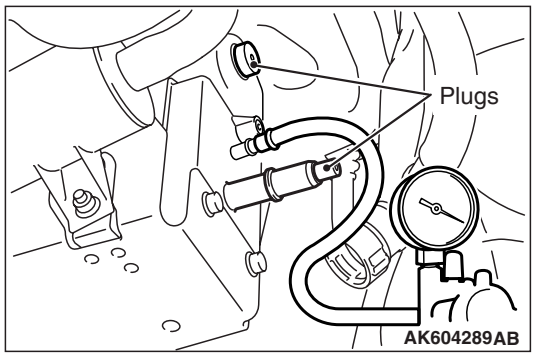
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Go to Step 14.

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 13 .

STEP 12. Check the evaporative emission canister for vacuum leaks.



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(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 13.

NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-87). Then go to Step 14.

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 14 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14 .

STEP 14. Perform the OBD-II drive cycle.

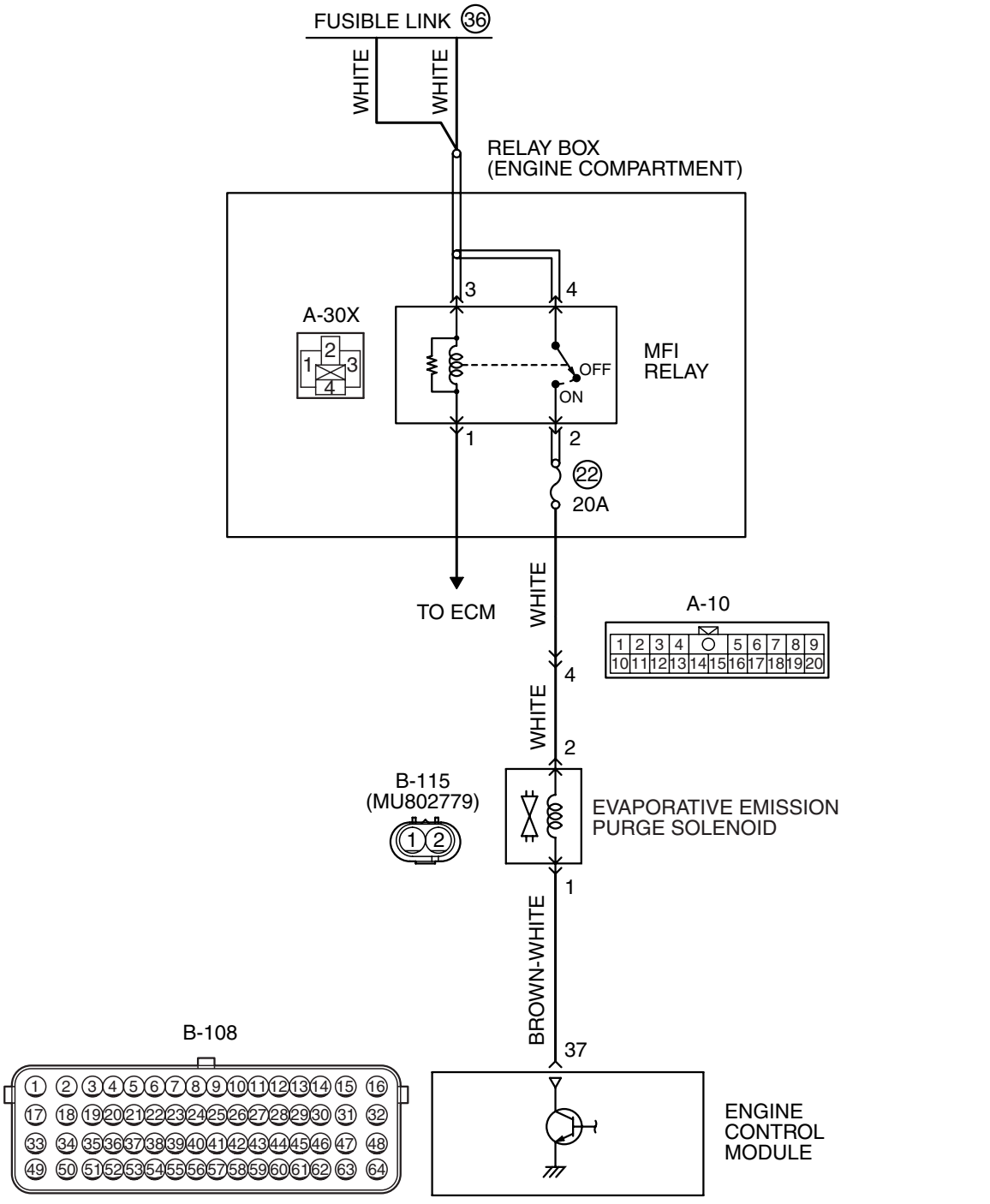
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-10).
(2) Read the DTC.

Q: Is DTC P0442 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0443: Evaporative Emission Control System Purge Control Valve Circuit

EVAPORATIVE EMISSION PURGE SOLENOID CIRCUIT



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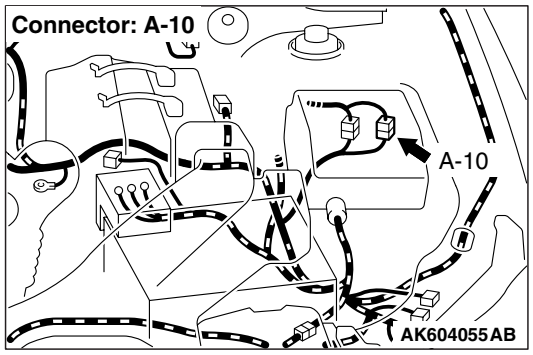
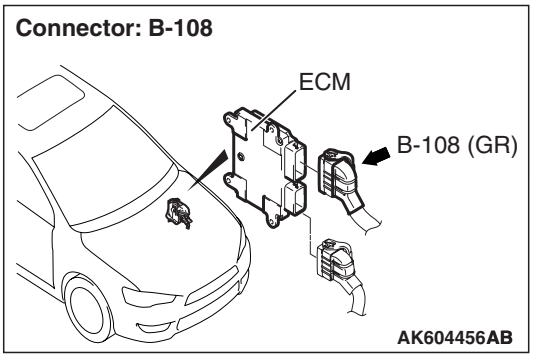
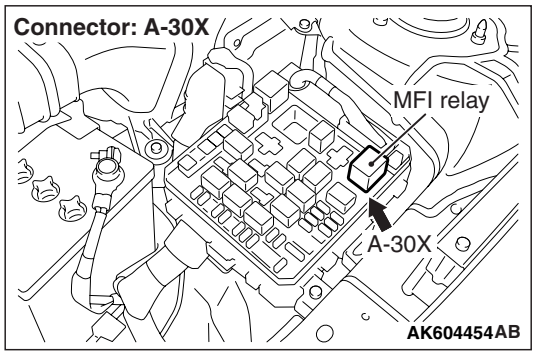
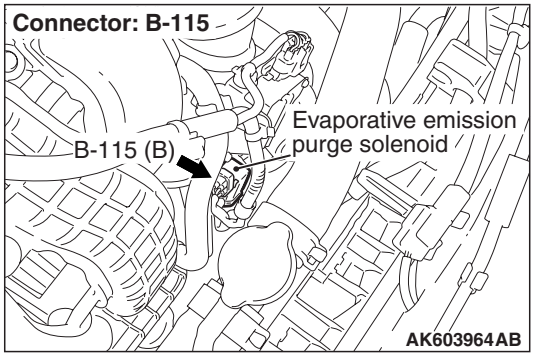








CIRCUIT OPERATION

- The evaporative emission purge solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground evaporative emission purge solenoid by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission purge solenoid drive circuit, the ECM measures the surge voltage of the evaporative emission purge solenoid coil.

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid is operated from on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

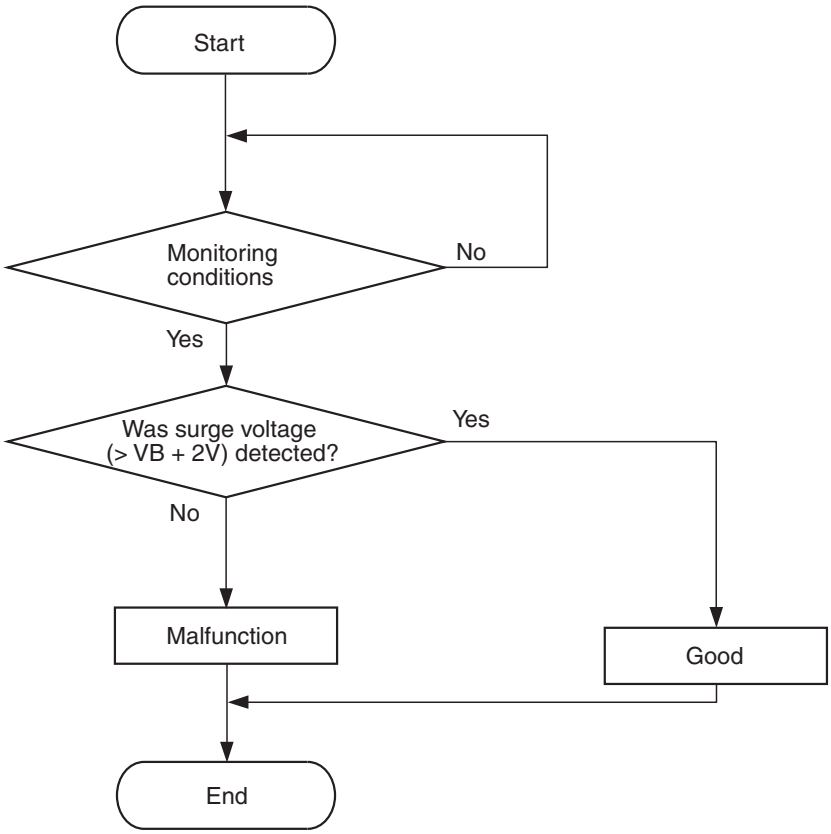
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is between 10 and 90 percent.
- Evaporative emission ventilation solenoid is off.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission purge solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission purge solenoid is turned off.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission purge solenoid failed.
- Open or shorted evaporative emission purge solenoid circuit, harness damage, or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

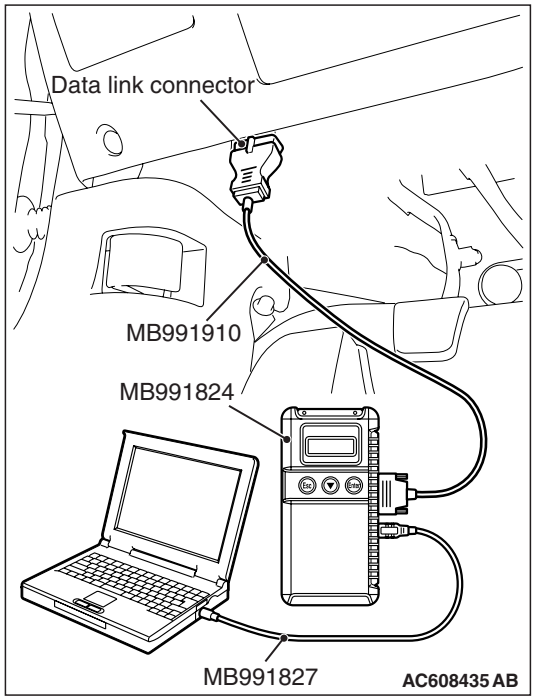
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 10: Evaporative Emission Purge Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 10, Evaporative emission purge solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission purge solenoid is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How Cope with Intermittent Malfunctions P.00-13.

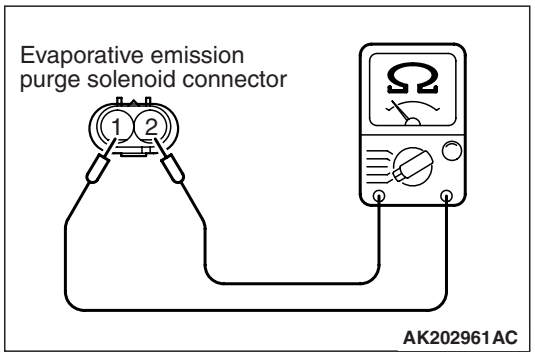
NO : Go to Step 2.

STEP 2. Check harness connector B-115 at the evaporative emission purge solenoid for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



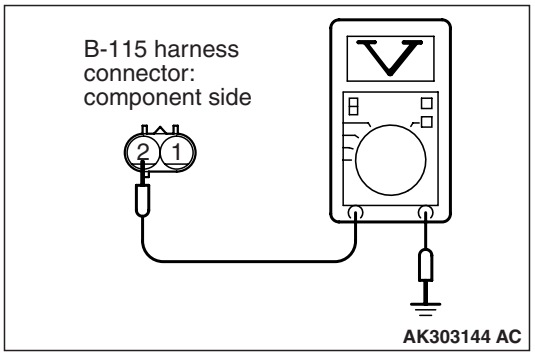
STEP 3. Check the evaporative emission purge solenoid.

(1) Disconnect the evaporative emission purge solenoid connector B-115.
(2) Measure the resistance between evaporative emission purge solenoid side connector terminal No. 1 and No. 2.

Standard value: 22 –26 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 22 and 26 ohms [at 20° C (68° F)]?

YES : Go to Step 4.
NO : Replace the evaporative emission purge solenoid. Then go to Step 10.



STEP 4. Measure the power supply voltage at evaporative emission purge solenoid harness side connector B-115.

(1) Disconnect the connector B-115 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and evaporative emission purge solenoid connector B-115 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check harness connector B-108 at the ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

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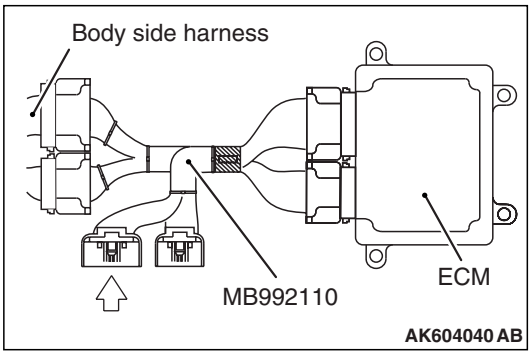
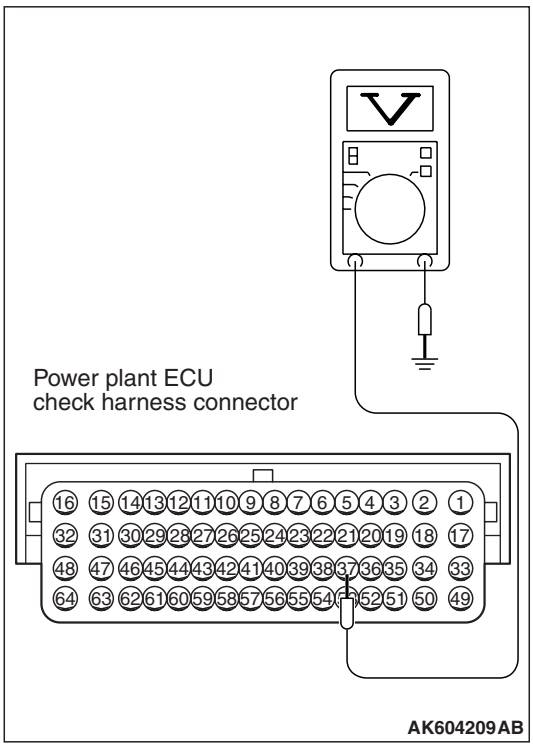
STEP 7. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 37 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.
NO : Repair harness wire between evaporative emission purge solenoid connector B-115 (terminal No. 1) and ECM connector B-108 (terminal No. 37) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 8. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and evaporative emission purge solenoid connector B-115 (terminal No. 2).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 10.

STEP 9. Check for harness damage between evaporative emission purge solenoid connector B-115 (terminal No. 1) and ECM connector B-108 (terminal No. 37).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.

NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

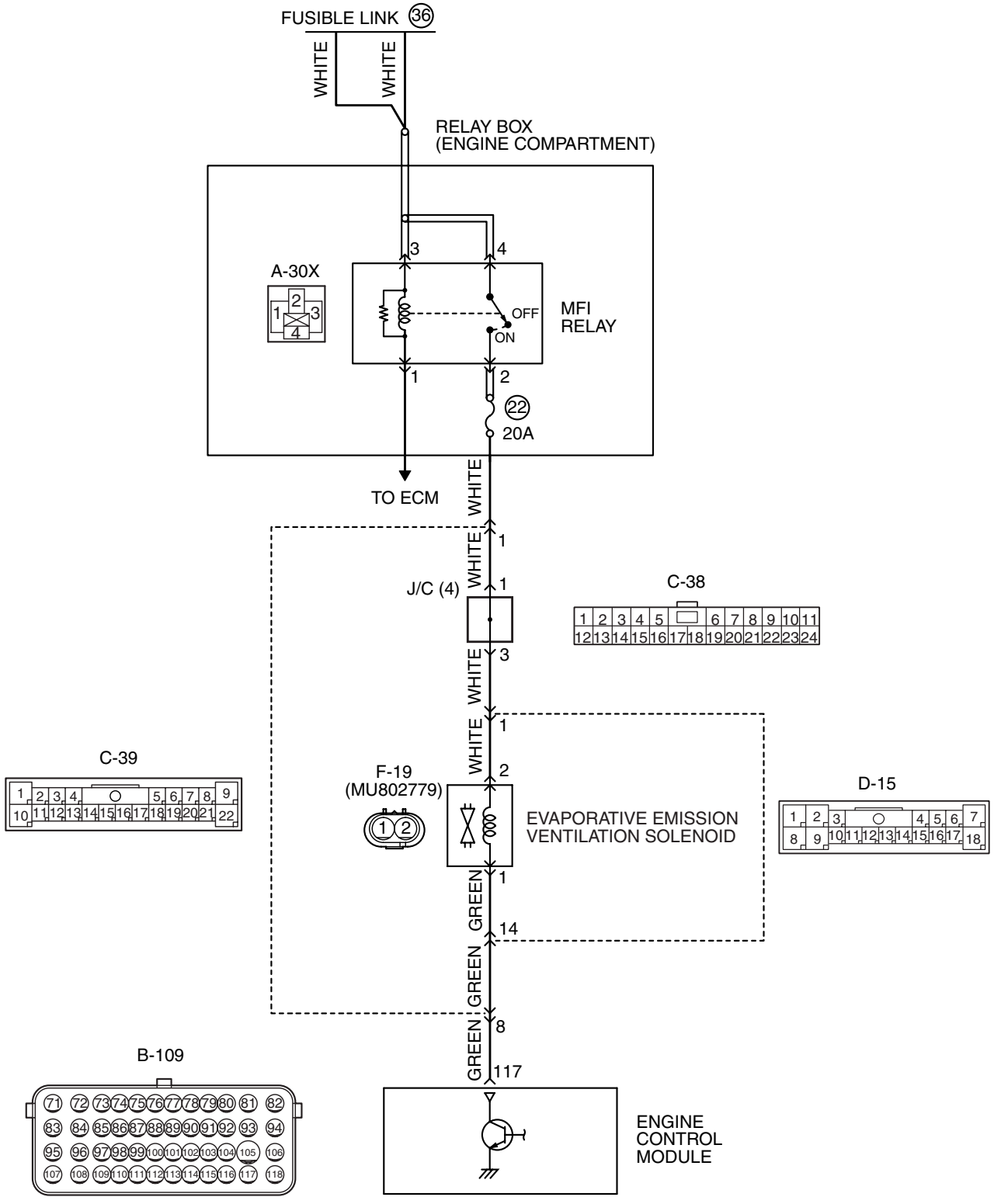
Q: Is DTC P0443 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0446: Evaporative Emission Control System Vent Control Circuit

EVAPORATIVE EMISSION VENTILATION SOLENOID CIRCUIT



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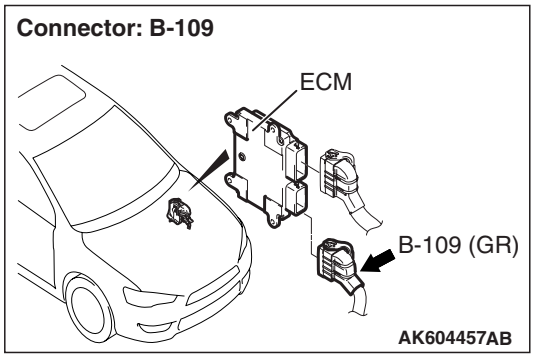
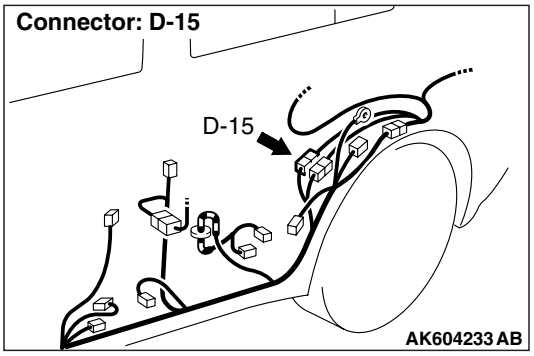
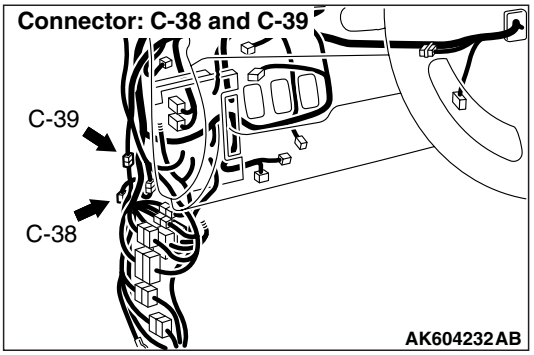
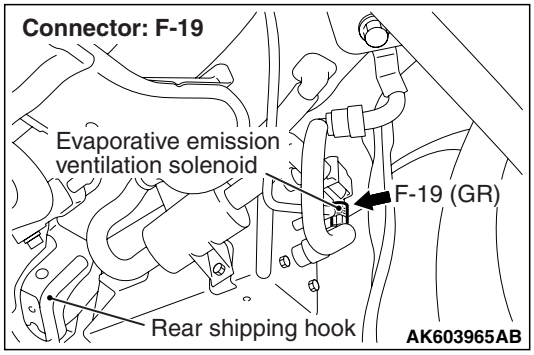








CIRCUIT OPERATION

- The evaporative emission ventilation solenoid power is supplied from the MFI relay (terminal No. 2).
- The ECM controls the evaporative emission ventilation solenoid ground by turning the power transistor in the ECM ON and OFF.

TECHNICAL DESCRIPTION

- To judge if there is open circuit in the evaporative emission ventilation solenoid drive circuit, ECM measures the surge voltage of the evaporative emission ventilation solenoid coil.
- The ECM drives the evaporative emission ventilation solenoid. After the solenoid is turned off, the ECM will check if the solenoid coil produces a surge voltage (battery positive voltage + 2 volts).

DESCRIPTIONS OF MONITOR METHODS

Off-surge does not occur after solenoid is operated on to off.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

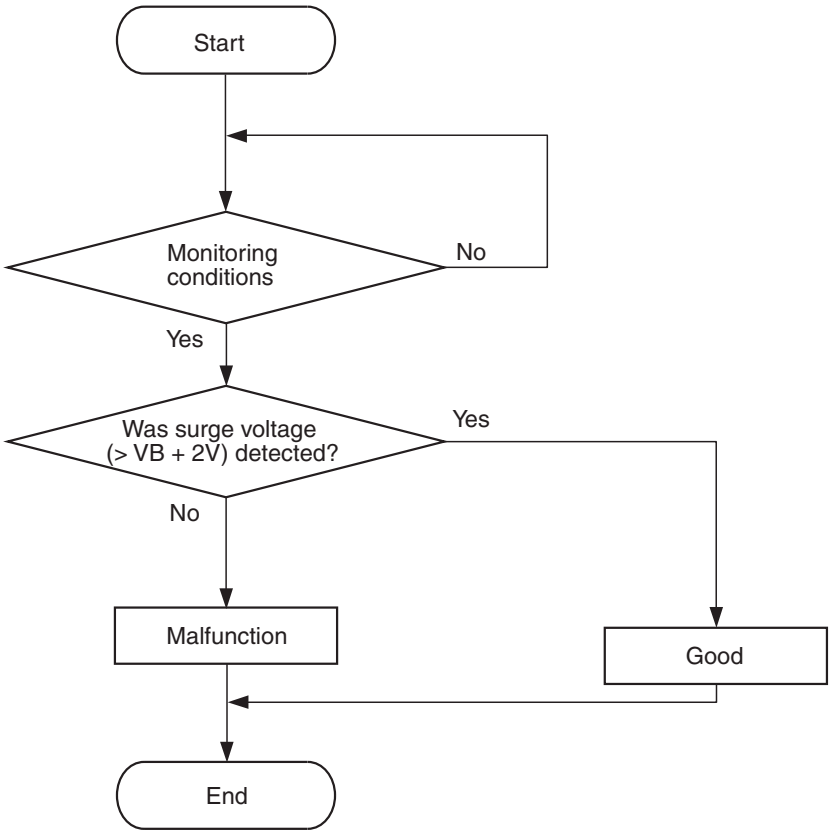
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Engine is being cranked.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criteria
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 0.2 second.
- The ECM monitors for this condition once during the drive cycle.

Check Conditions
- Battery positive voltage is between 10 and 16.5 volts.
- ON duty cycle of the evaporative emission purge solenoid is 0 percent.
- Evaporative emission ventilation solenoid is ON.
- More than 1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion
- The evaporative emission ventilation solenoid coil surge voltage (battery positive voltage + 2 volts) is not detected for 1 second after the evaporative emission ventilation solenoid is turned OFF.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Evaporative emission ventilation solenoid failed.
- Open or shorted evaporative emission ventilation solenoid circuit, harness damage, or connector damage.
- ECM failed.

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DIAGNOSIS

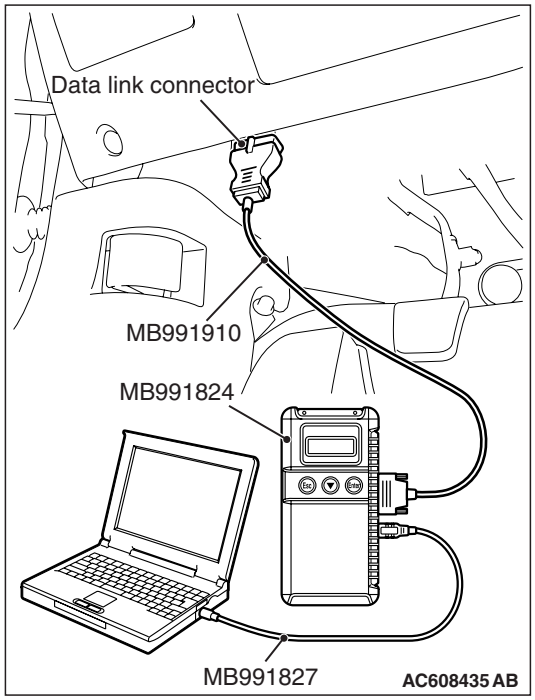
Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check actuator test item 15: Evaporative Emission Ventilation Solenoid.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the actuator test mode for item 15, Evaporative emission ventilation solenoid.
  - An operation sound should be heard and vibration should be felt when the evaporative emission ventilation solenoid is operated.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the solenoid operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

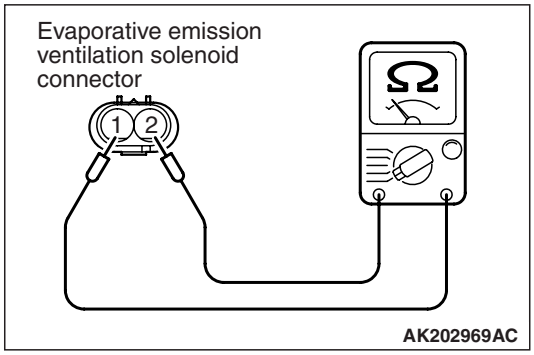
NO : Go to Step 2.

STEP 2. Check harness connector F-19 at the evaporative emission ventilation solenoid for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.



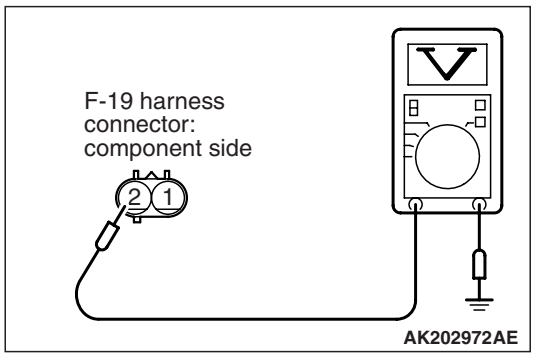
STEP 3. Check the evaporative emission ventilation solenoid.

(1) Disconnect the evaporative emission ventilation solenoid connector F-19.
(2) Measure the resistance between evaporative emission ventilation solenoid side connector terminal No. 1 and No. 2.

Standard value: 17 –21 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 17 and 21 ohms [at 20° C (68° F)]?

YES : Go to Step 4.
NO : Replace it. Then go to Step 10.



STEP 4. Measure the power supply voltage at evaporative emission ventilation solenoid harness side connector F-19.

(1) Disconnect the connector F-19 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check connectors C-38, C-39 and D-15 at intermediate connectors for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and evaporative emission ventilation solenoid connector F-19 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Check harness connector B-109 at the crankshaft position sensor for damage.

Q: Is the harness connector in good condition?

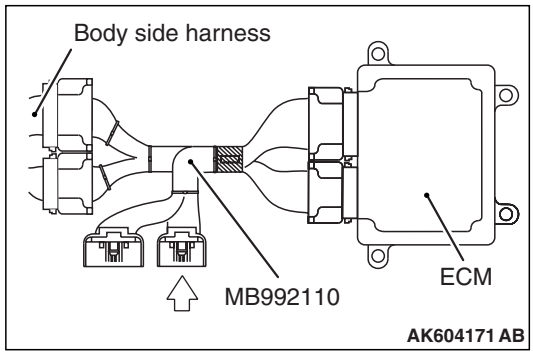
YES : Go to Step 7.

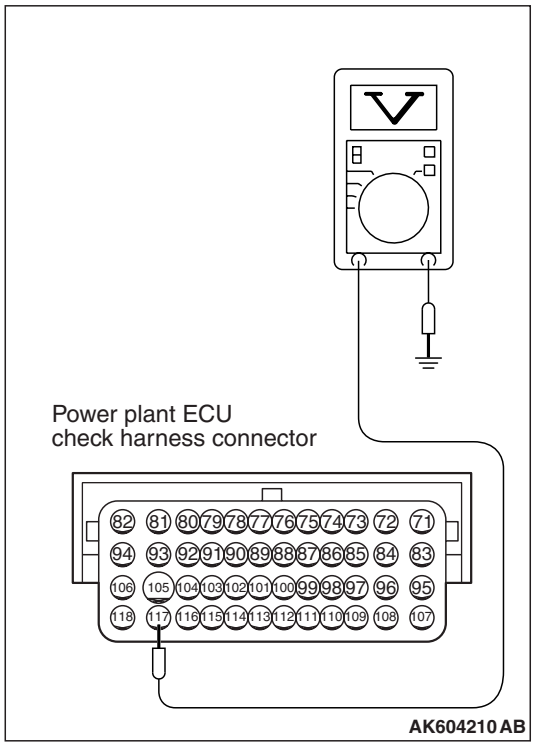
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 7. Measure the power supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.

(2) Turn the ignition switch to the "ON" position.





(3) Measure the voltage between terminal No. 117 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Check harness connectors C-39 and D-15 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between evaporative emission ventilation solenoid connector F-19 (terminal No. 1) and ECM connector B-109 (terminal No. 117) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 8. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and evaporative emission ventilation solenoid connector F-19 (terminal No. 2).

NOTE: Check harness after checking intermediate connectors C-38, C-39 and D-15. If intermediate connectors are damaged, repair or replace them. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 10.

STEP 9. Check for harness damage between evaporative emission ventilation solenoid connector F-19 (terminal No. 1) and ECM connector B-109 (terminal No. 117).

NOTE: Check harness after checking intermediate connector C-39 and D-15. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.
NO : Repair it. Then go to Step 10.

STEP 10. Test the OBD-II drive cycle.

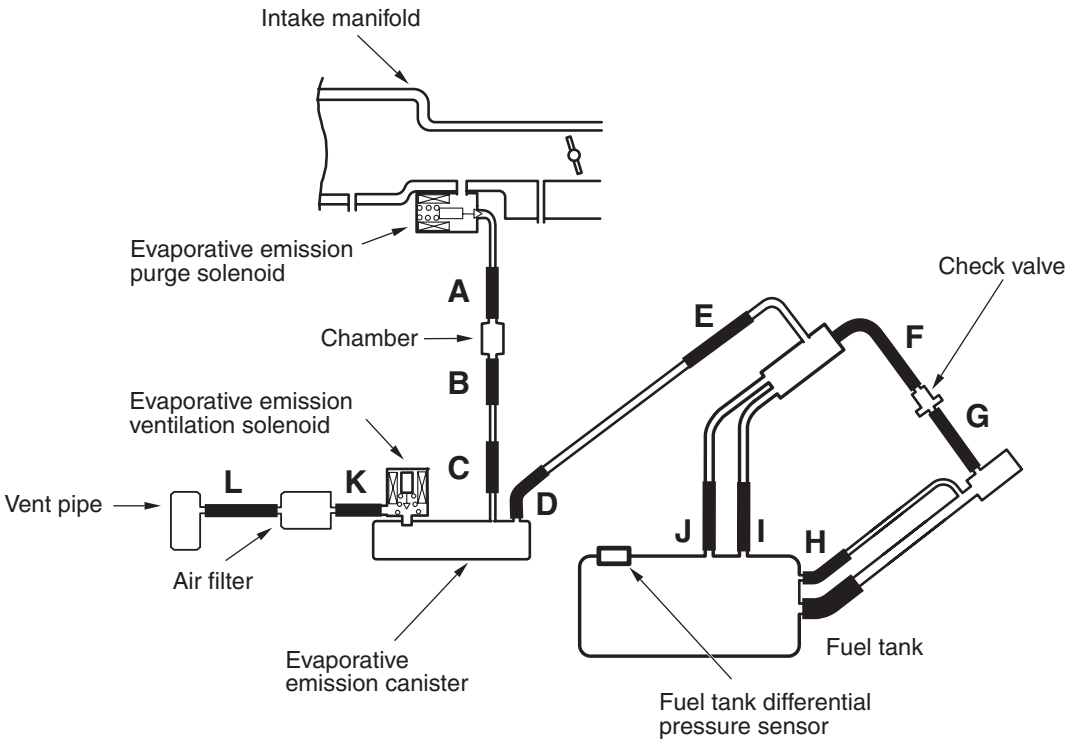
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0446 set?

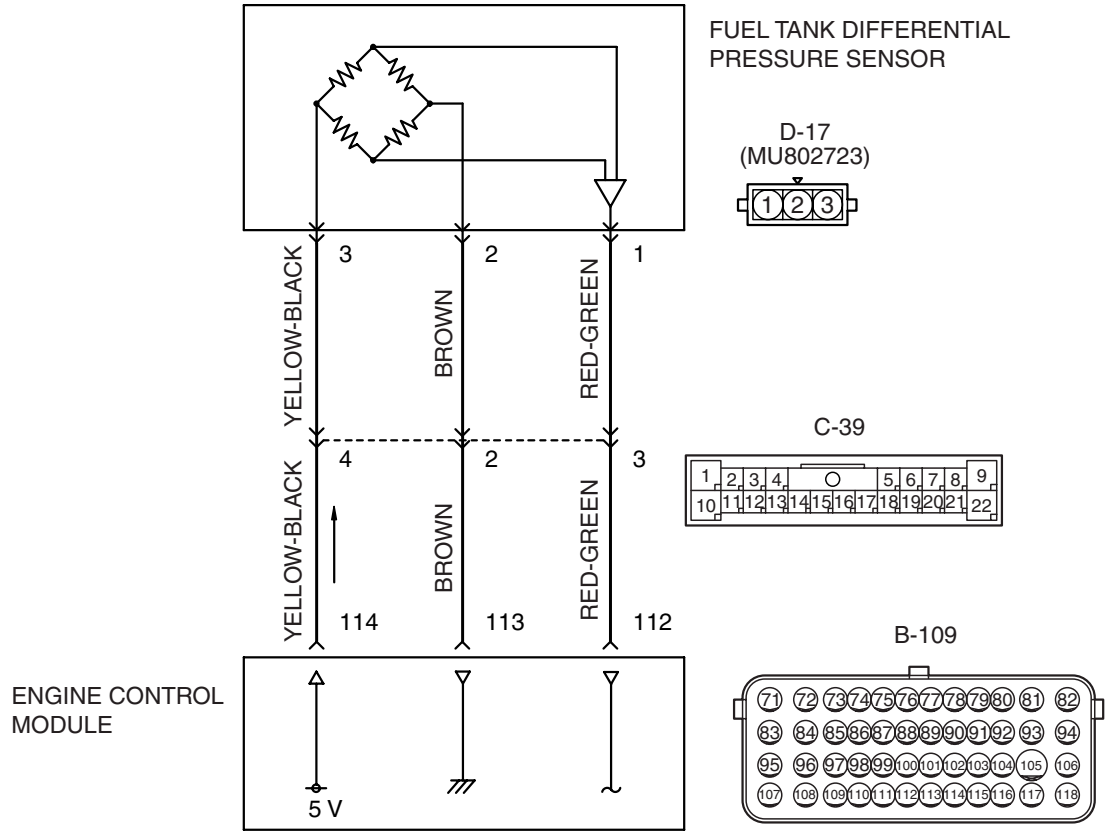
YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0450: Evaporative Emission Control System Pressure Sensor Malfunction

System diagram



FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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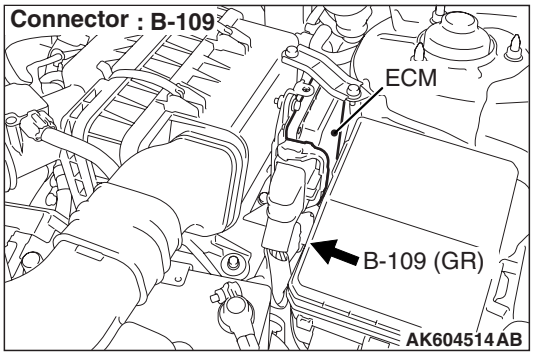

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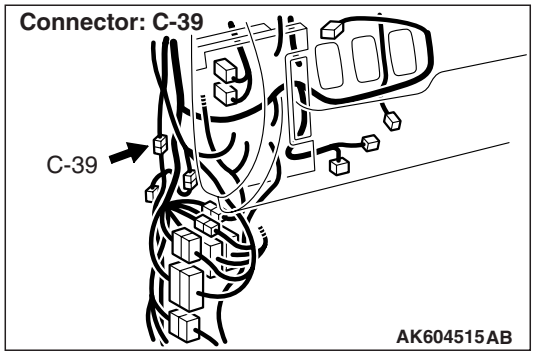

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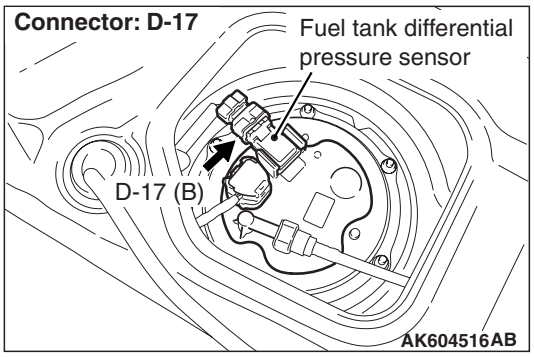


CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

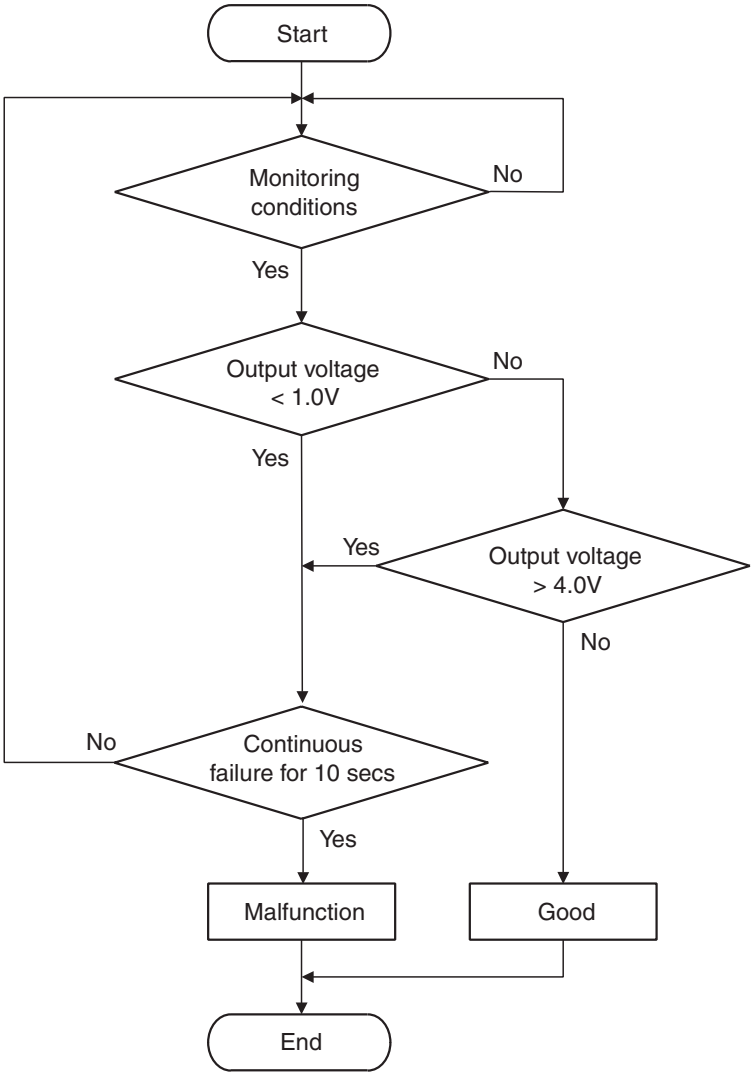
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK604517 AB

Check Conditions

- Intake air temperature is greater than 5° C (41° F).
- Engine speed is 1,594 r/min or greater.
- Volumetric efficiency is between 20 and 80 percent.

Judgement Criteria

- When the evaporative emission purge solenoid is off, the fuel differential pressure sensor output voltage remains 1.0 volt or less for ten seconds.

Check Conditions

- Intake air temperature is between 5° C (41° F) and 45° C (113° F) or greater.
- Engine speed is 1,594 r/min or greater.
- Volumetric efficiency is between 20 and 80 percent.

Judgement Criteria

- When the evaporative emission purge solenoid valve is fully operational (100 percent ratio), the fuel differential pressure sensor output voltage remains at 4.0 volts or greater for ten seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0450 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (52: Fuel tank differential PRS. SNSR). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

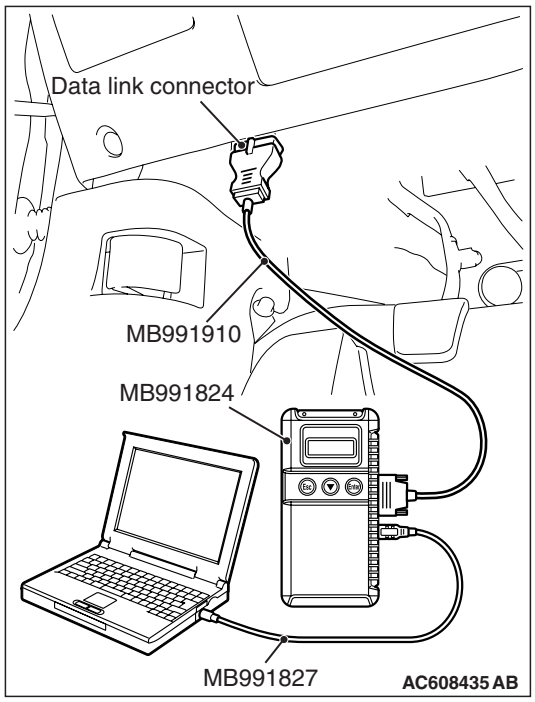
Required Special Tools:

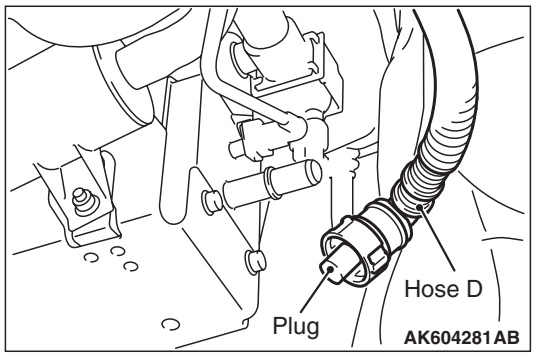
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
- MB991824: V.C.I.
- MB991827: M.U.T.-III USB Cable
- MB991910: M.U.T.-III Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

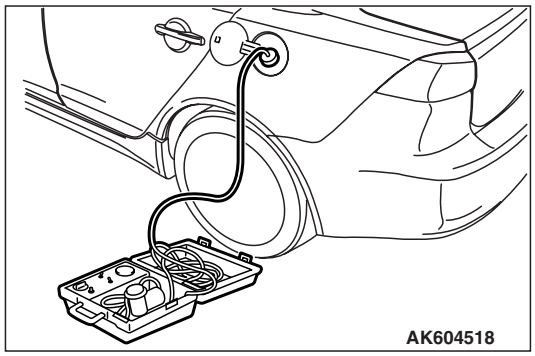
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Plug the disconnected end of hose D.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 1,500 to 3,500 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.

Q: Does the output voltage of differential pressure sensor increase when pressure the fuel tank?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13).

NO : Go to Step 2 .

TSB Revision

STEP 2. Check harness connector B-109 at ECM and harness connector D-17 at fuel tank differential pressure sensor for damage.

Q: Is the harness connector in good condition?

YES : Then go to Step 3 .

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8 .

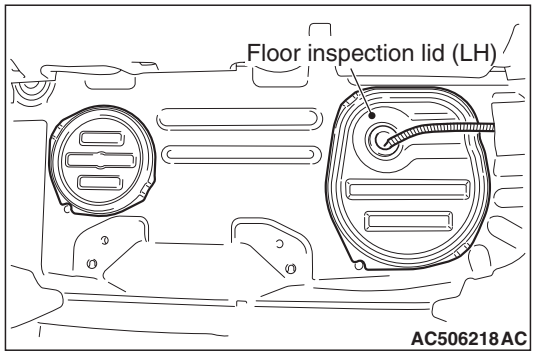
STEP 3. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-17.

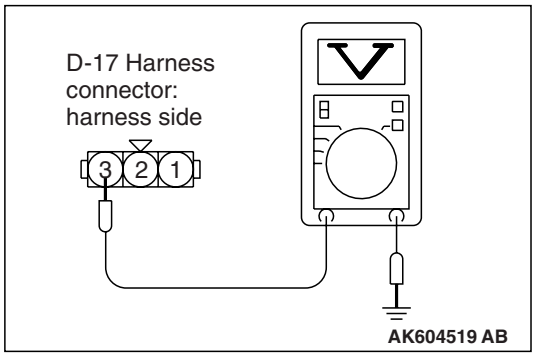
(1) Remove the rear seat assembly (Refer to GROUP 52A, Rear Seat Assembly Removal And Installation P.52A-23).

(2) Remove the floor inspection lid (LH).

(3) Disconnect fuel tank differential pressure sensor connector D-17.

(4) Turn the ignition switch to the "ON" position.





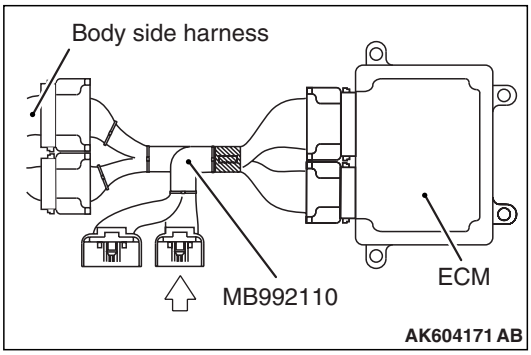
(5) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

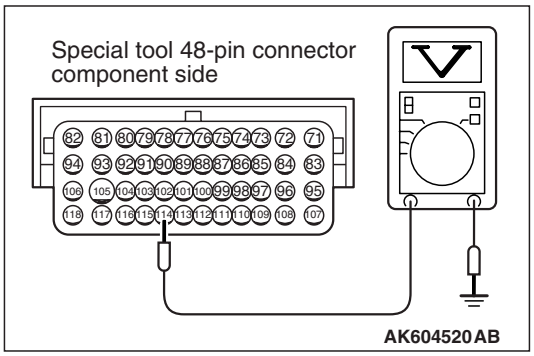
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5 .

NO : Go to Step 4 .





STEP 4. Measure the 5 volts reference signal at ECM connector B-109 by using check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.

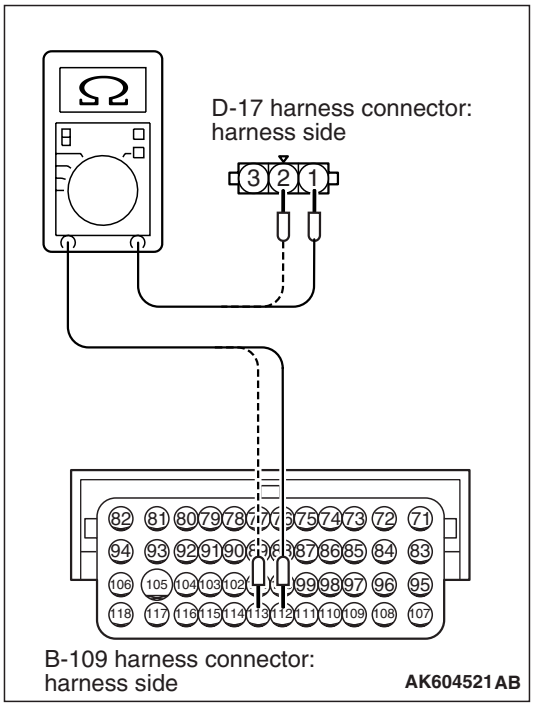
(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

NO : Go to Step 6 .



STEP 5. Check the harness wire between ECM connector B-109 and fuel tank differential pressure sensor connector D-17 for damage.

(1) Disconnect the connector B-109 and D-17 measure at the harness side.

(2) Measure the resistance between connector B-109 and connector D-17.

a. Connector B-109 (terminal No. 112) and connector D-17 (terminal No. 1).

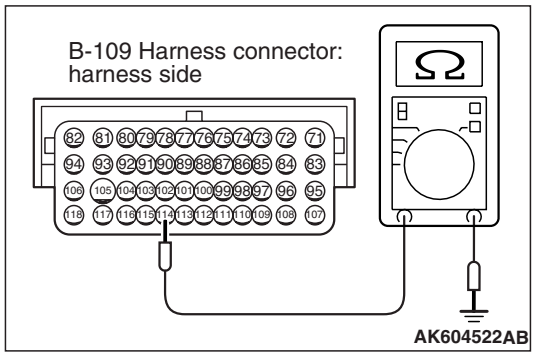
b. Connector B-109 (terminal No. 113) and connector D-17 (terminal No. 2).

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 7 .

NO : Repair the damaged harness wires. Then go to Step 8 .



STEP 6. Check for short circuit to ground between fuel tank differential pressure sensor connector D-17 and ECM connector B-109.

(1) Disconnect the connector D-17 and B-109 measure at the harness side.

(2) Check for the continuity between connector B-109 (terminal No. 114) and ground.

- Not continuity.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8 .

NO : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of short circuit to fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

STEP 7. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 5 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0450 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8 .
NO : The inspection is complete.

STEP 8. Perform the OBD-II drive cycle.

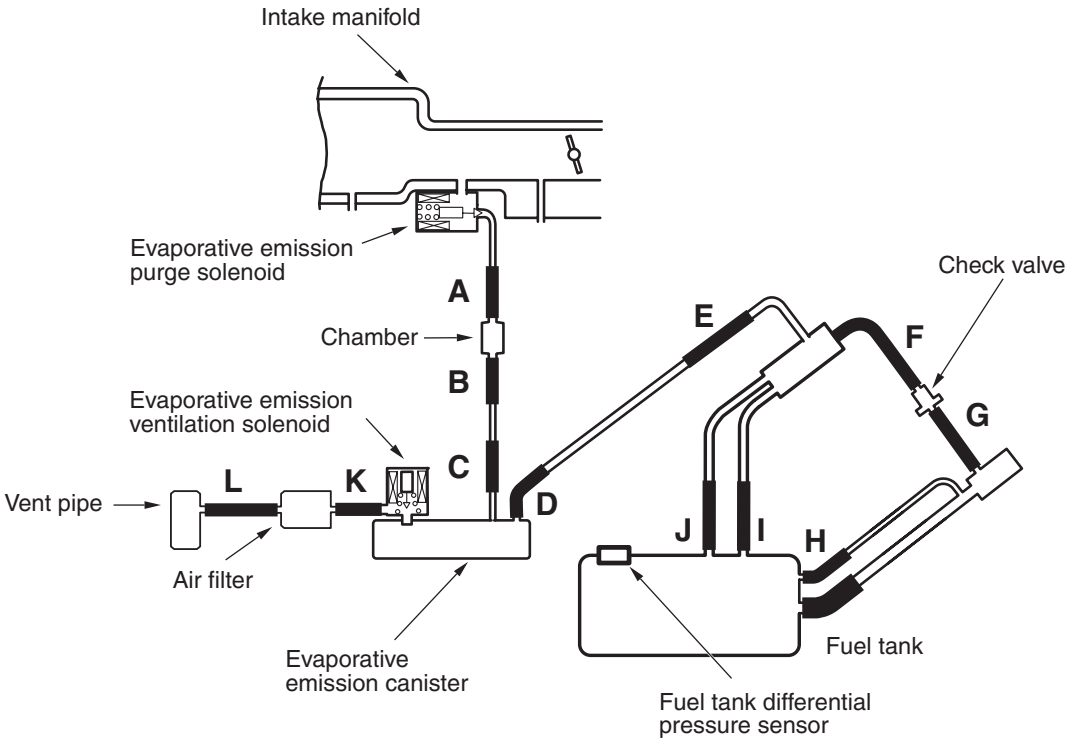
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0450 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

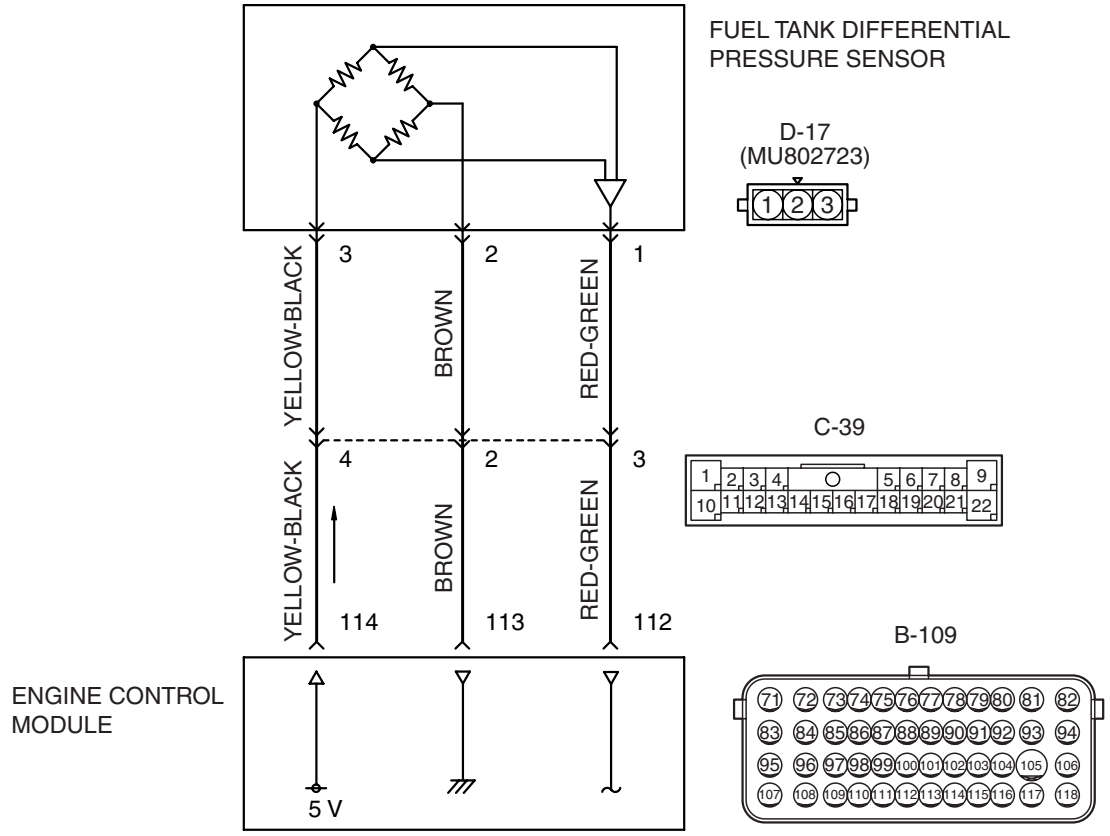
DTC P0451: Evaporative Emission Control System Pressure Sensor Range/Performance

System diagram



TSB Revision

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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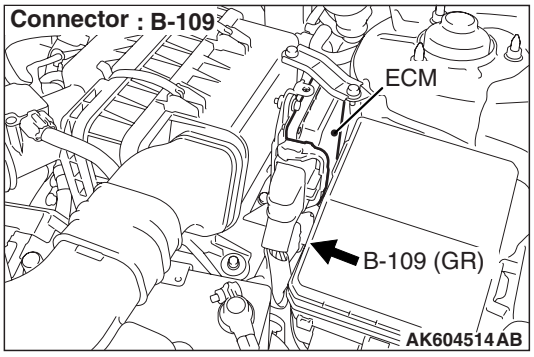
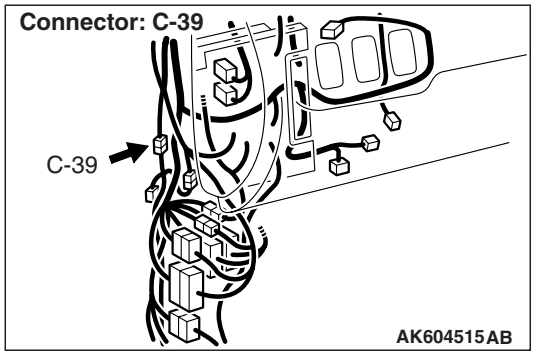
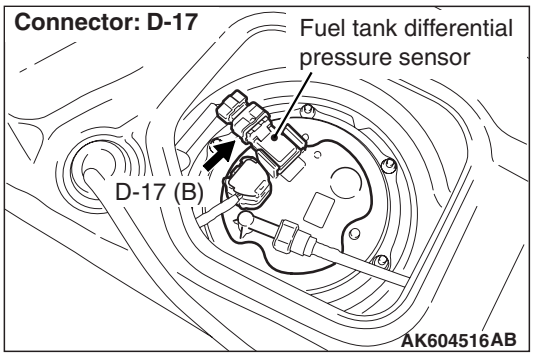




TSB Revision



CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor signal voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Detect malfunction if change of fuel tank differential pressure sensor output voltage during idling stays large during specified go/stop operations.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

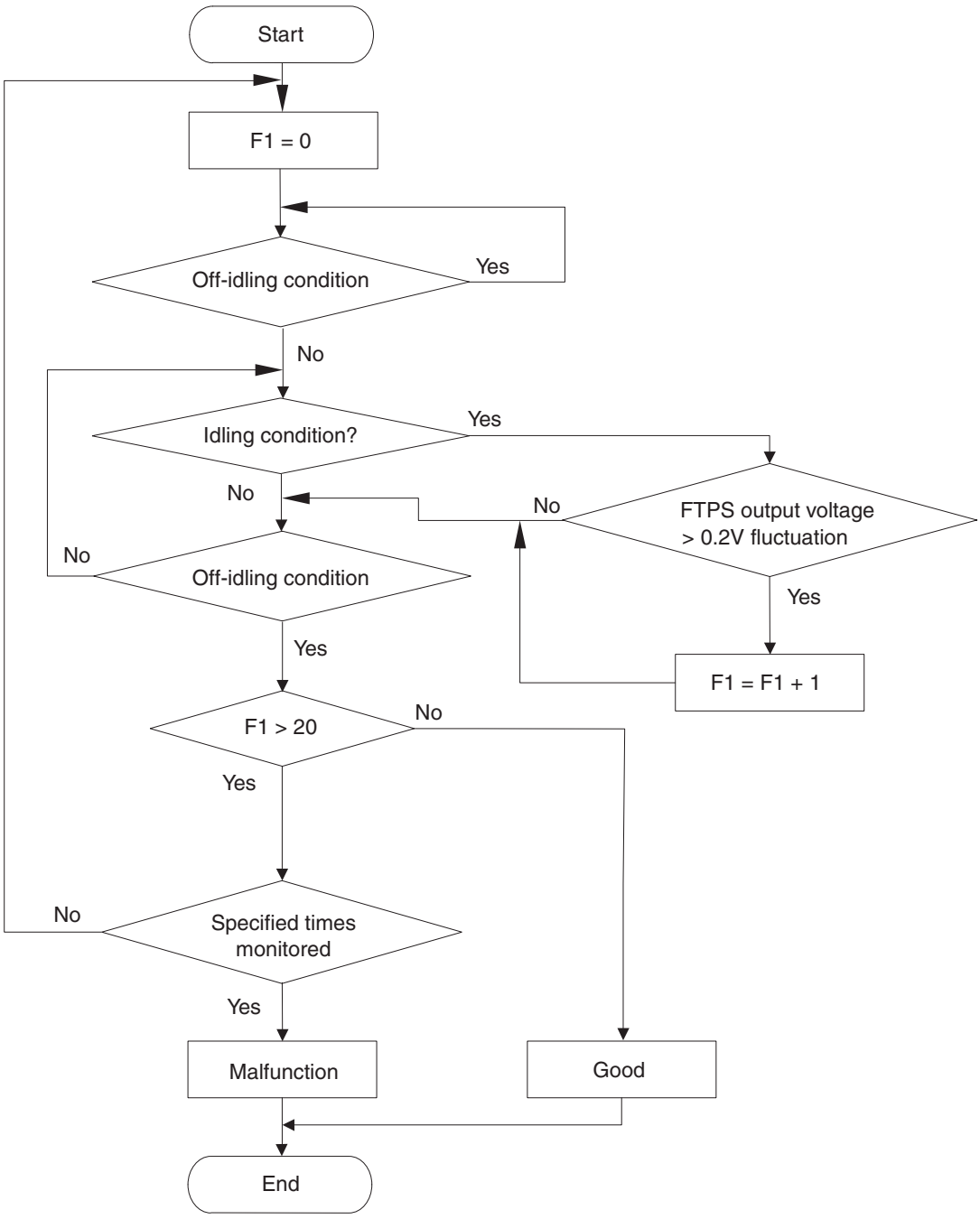
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

- Throttle valve is closed.
- Vehicle speed is 1.5 km/h (0.93 mph) or less.

Judgement Criteria

- If the voltage signal from the fuel tank differential pressure sensor changes by 0.2 volt or more, DTC P0451 will set. The code may also set if a sudden pressure fluctuation occurs twenty times while the engine is idling, and then four consecutive times during normal driving.

TSB Revision

NOTE: If the number of sudden pressure fluctuations does not reach twenty during any one period of engine idling, or if the ignition switch is turned OFF, the counter will reset to zero.

NOTE: The conditions for deviating from idling operation are as follows:

- *Vehicle speed is 50 km/h (31 mph) or greater.*

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 16 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0451 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (52:Fuel differential PRS SNSR). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

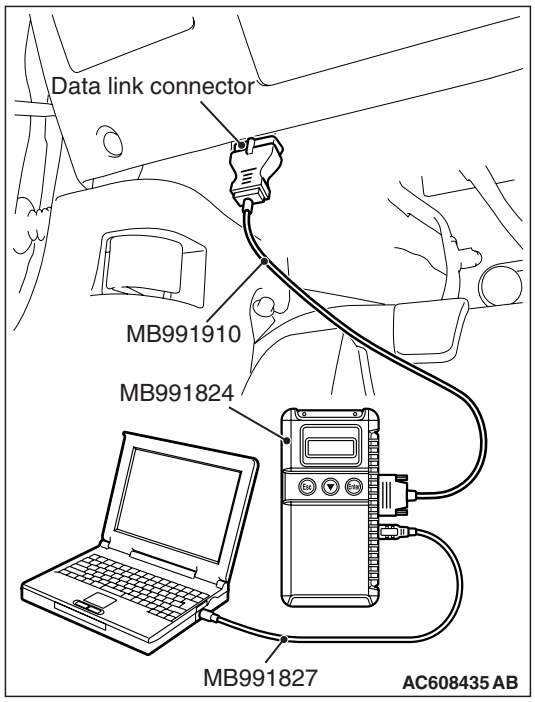
Required Special Tools:

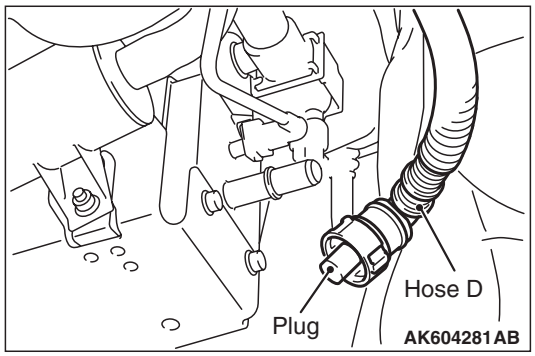
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB992110: Power Plant ECU Check Harness

STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

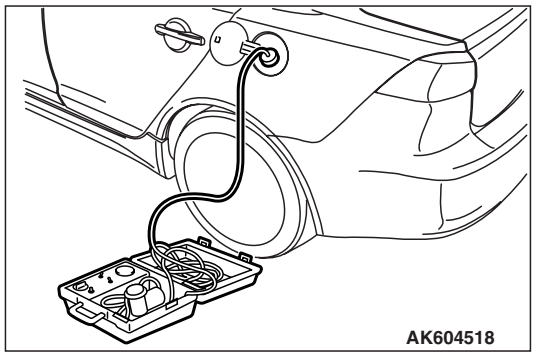
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Plug the disconnected end of hose D.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 1,500 to 3,500 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.

Q: Does the output voltage of differential pressure sensor increase when pressure the fuel tank?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13).

NO : Go to Step 2 .

TSB Revision

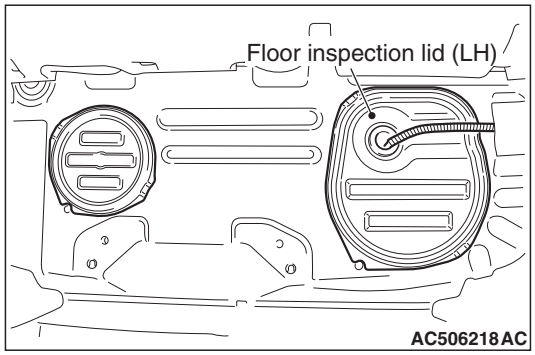
STEP 2. Check harness connector B-109 at ECM and harness connector D-17 at fuel tank differential pressure sensor for damage.

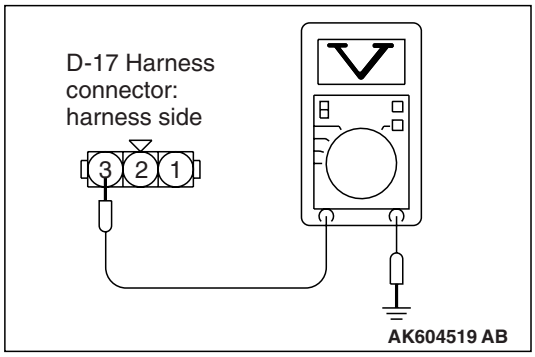
Q: Is the harness connector in good condition?

YES : Then go to Step 3 .
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7 .

STEP 3. Measure the 5-volt reference signal at fuel tank differential pressure sensor connector D-17.

(1) Remove the rear seat assembly (Refer to GROUP 52A, Rear Seat Assembly Removal And Installation P.52A-23).
(2) Remove the floor inspection lid (LH).
(3) Disconnect fuel tank differential pressure sensor connector D-17.
(4) Turn the ignition switch to the "ON" position.



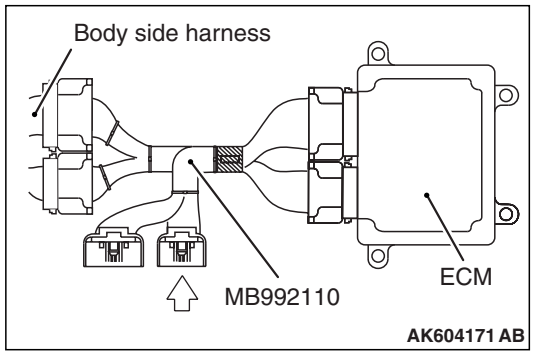


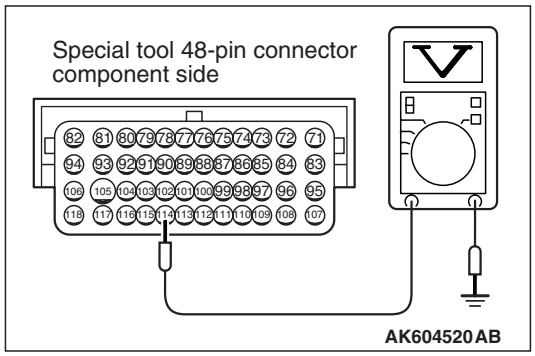
(5) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 5 .
NO : Go to Step 4 .





STEP 4. Measure the 5 volts reference signal at ECM connector B-109 by using check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.

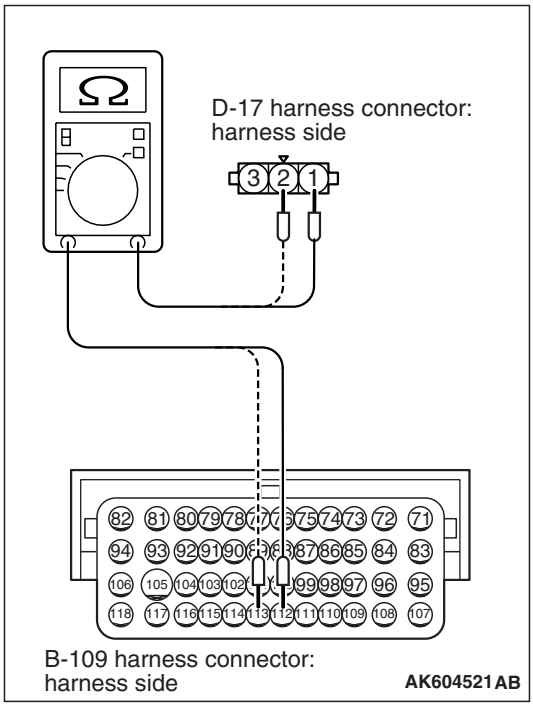
(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

NO : Go to Step 6 .



STEP 5. Check the harness wire between ECM connector B-109 and fuel tank differential pressure sensor connector D-17 for damage.

(1) Disconnect the connector B-109 and D-17 measure at the harness side.

(2) Measure the resistance between connector B-109 and connector D-17.

a. Connector B-109 (terminal No. 112) and connector D-17 (terminal No. 1).

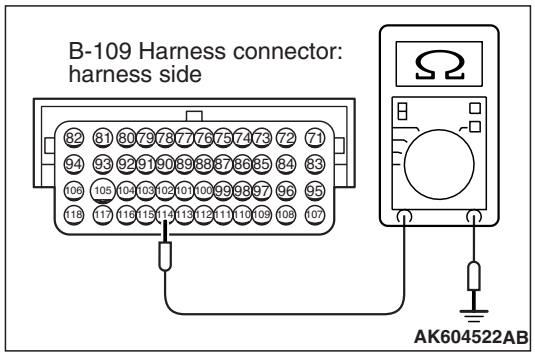
b. Connector B-109 (terminal No. 113) and connector D-17 (terminal No. 2).

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 7 .

NO : Repair the damaged harness wires. Then go to Step 8 .



STEP 6. Check for short circuit to ground between fuel tank differential pressure sensor connector D-17 and ECM connector B-109.

(1) Disconnect the connector D-17 and B-109 measure at the harness side.

(2) Check for the continuity between connector B-109 (terminal No. 114) and ground.

- Not continuity.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8 .

NO : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of short circuit to fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

STEP 7. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 16 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0451 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8 .
NO : The inspection is complete.

STEP 8. Perform the OBD-II drive cycle.

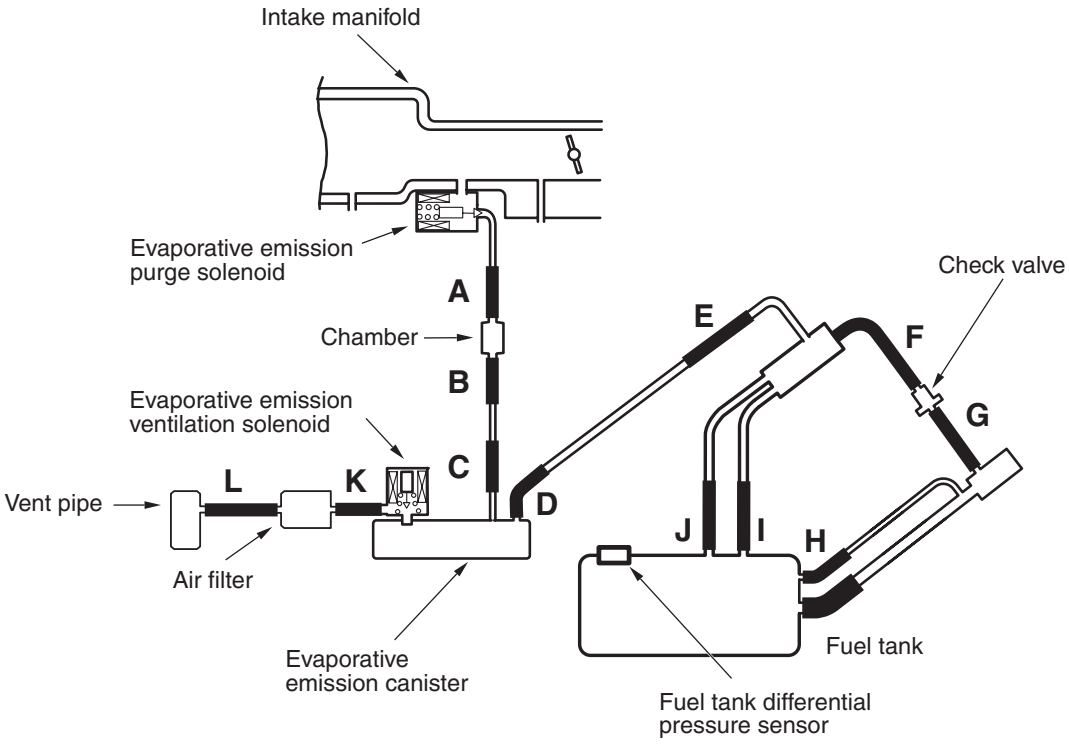
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 16 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0451 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

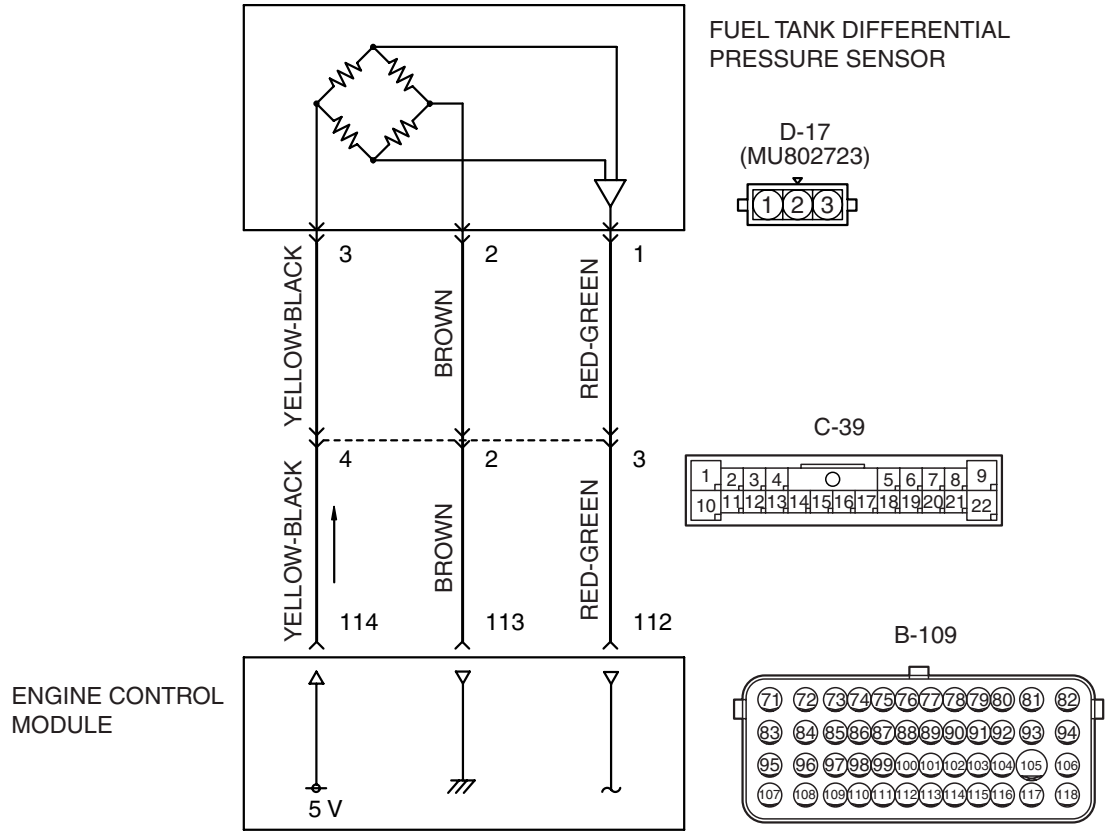
DTC P0452: Evaporative Emission System Pressure Sensor Low Input

System diagram



TSB Revision

FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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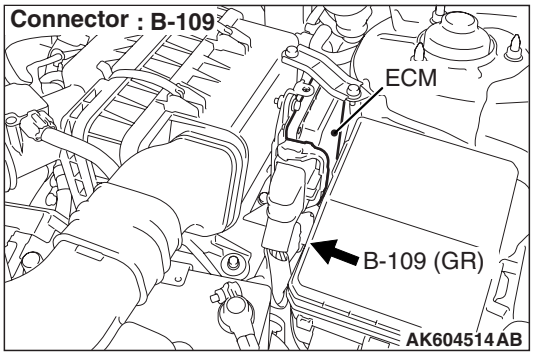
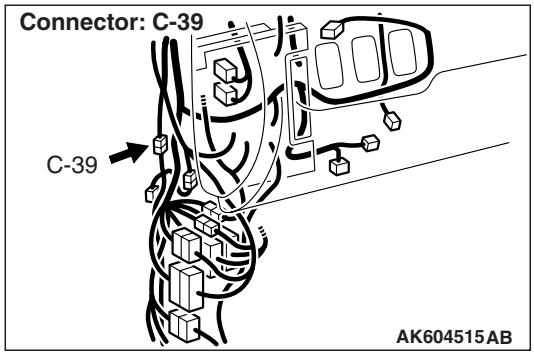
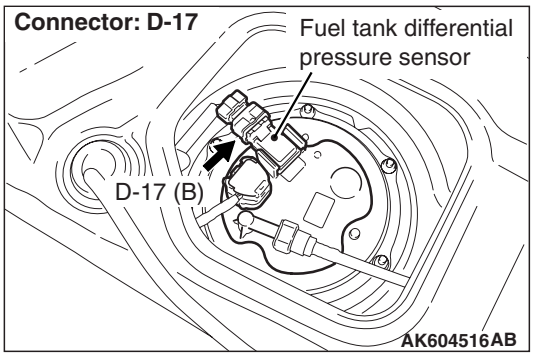




TSB Revision



CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference signal to the fuel tank differential pressure sensor (terminal No. 3). The fuel tank differential pressure sensor (terminal No. 2) is grounded through the ECM (terminal No. 113).
- The fuel tank differential pressure sensor (terminal No. 1) returns a voltage signal to the ECM (terminal No. 112) that is proportional to the pressure in the fuel tank.

TECHNICAL DESCRIPTION

- The ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM determines whether the fuel tank differential pressure sensor signal voltage is within normal operating parameters.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

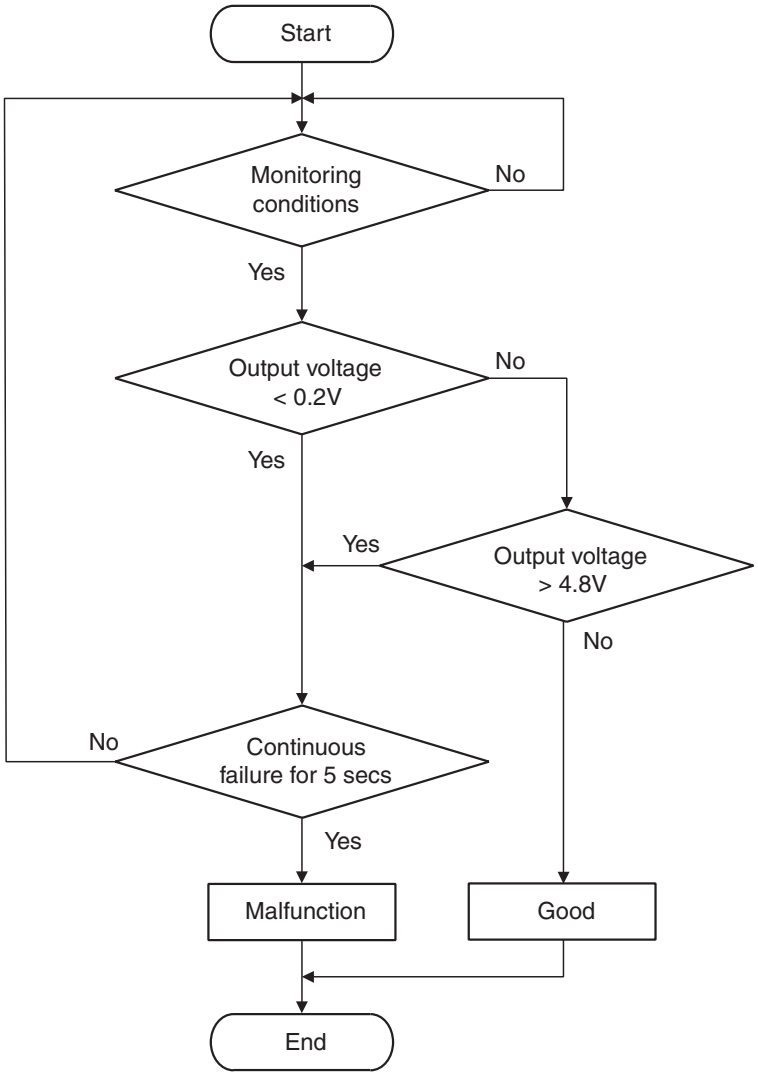
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.

Judgement Criteria

- The fuel tank differential pressure sensor output voltage remains 0.2 volt or less for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 24 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0452 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM failure.

TSB Revision

- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (52: Fuel tank differential PRS. SNSR). The mechanical gauge reading is used to verify scan tool MB991958 reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

Required Special Tools:

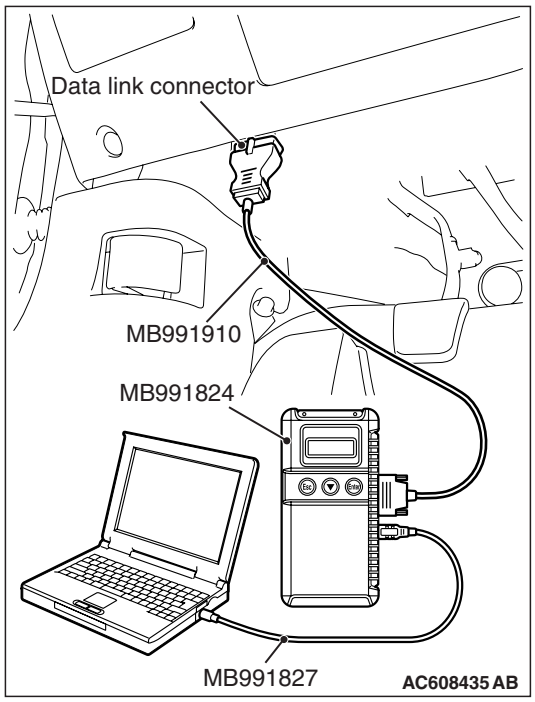
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A
- MB992110: Power Plant ECU Check Harness

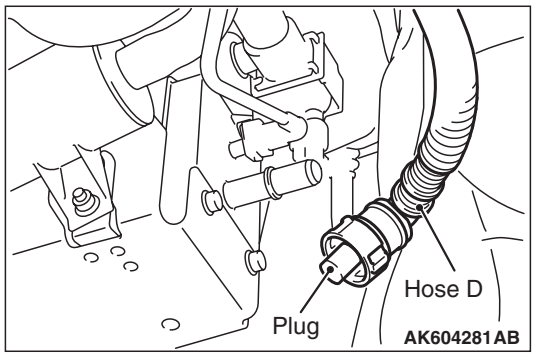
STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

⚠ CAUTION

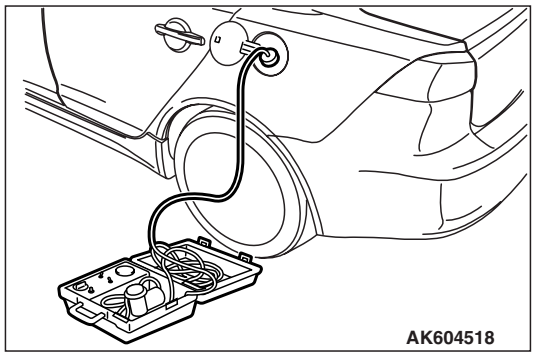
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 1,500 to 3,500 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.

Q: Does the output voltage of differential pressure sensor increase when pressure the fuel tank?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13).

NO : Go to Step 2 .

TSB Revision

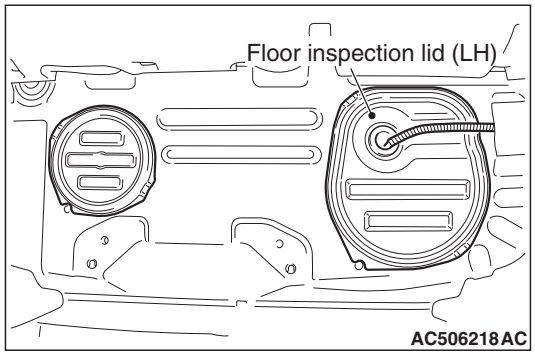
STEP 2. Check harness connector B-109 at ECM and harness connector D-17 at fuel tank differential pressure sensor for damage.

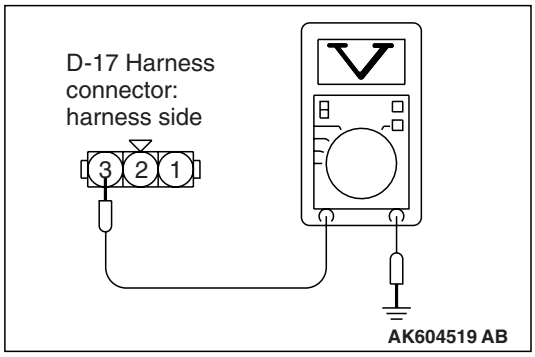
Q: Is the harness connector in good condition?

YES : Then go to Step 3 .
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8 .

STEP 3. Measure the 5 volts reference signal at fuel tank differential pressure sensor connector D-17.

(1) Remove the rear seat assembly (Refer to GROUP 52A, Rear Seat Assembly Removal And Installation P.52A-23).
(2) Remove the floor inspection lid (LH).
(3) Disconnect fuel tank differential pressure sensor connector D-17.
(4) Turn the ignition switch to the "ON" position.





(5) Measure the voltage between terminal 3 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

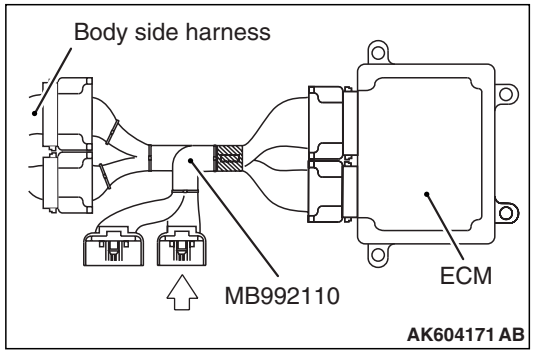
(6) Turn the ignition switch to the "LOCK" (OFF) position.

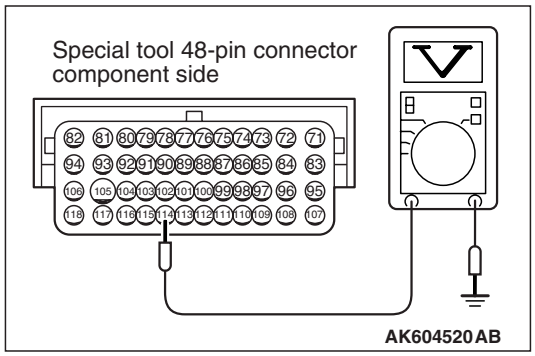
Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 6 .
NO : Go to Step 4 .

STEP 4. Measure the 5 volts reference signal at ECM connector B-109 by using check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.
(3) Remove the fuel cap.





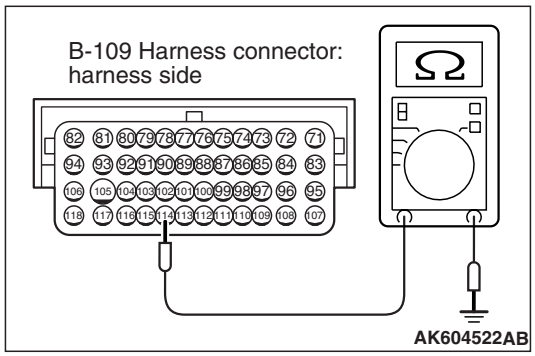
(4) Measure the voltage between terminal 114 and ground.
- The voltage should measure between 4.9 and 5.1 volts.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of harness damage fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

NO : Go to Step 5 .



STEP 5. Check for short circuit to ground between fuel tank differential pressure sensor connector D-17 and ECM connector B-109.

(1) Disconnect the connector D-17 and B-109 measure at the harness side.

(2) Check for the continuity between connector B-109 (terminal No. 114) and ground.

- No continuity.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8 .

NO : Check harness connector C-39 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness connector Inspection P.00E-2. If intermediate connector C-39 is in good condition, repair it because of short circuit to fuel tank differential pressure sensor connector D-17 (terminal No. 3) and ECM connector B-109 (terminal No. 114). Then go to Step 8 .

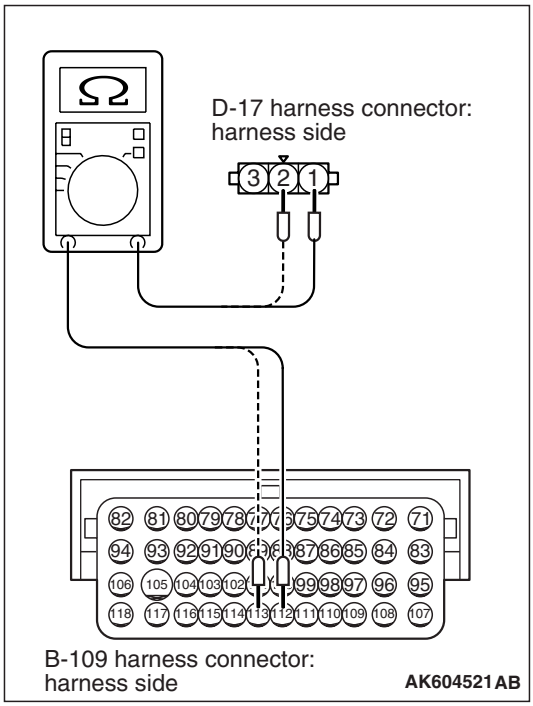
STEP 6. Check for open circuit or short circuit to ground or harness damage between fuel tank differential pressure sensor connector D-17 and ECM connector B-109.

(1) Disconnect the connector D-17 and B-109 measure at the harness side.

a. Measure the resistance between connector D-17 (terminal No. 1) and connector B-109 (terminal No. 112).

b. Measure the resistance between connector D-17 (terminal No. 2) and connector B-109 (terminal No. 113).

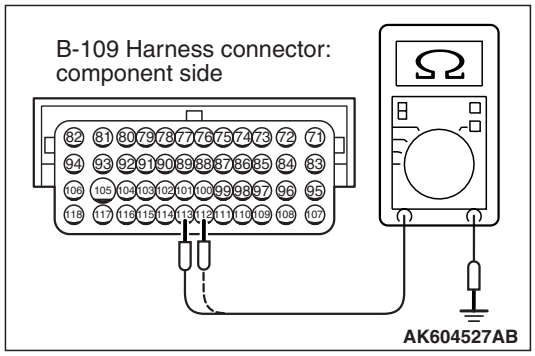
- Should be less than 2 ohms.



a. Check for the continuity between connector B-109 (terminal No. 112) and ground.

b. Check for the continuity between connector B-109 (terminal No. 113) and ground.

- No continuity.



Q: Is the harness connector in good condition?

YES : Then go to Step 7 .

NO : Repair it. Then go to Step 8 .

STEP 7. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.

(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 23 P.13A-10.

(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0452 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : The inspection is complete.

TSB Revision

STEP 8. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

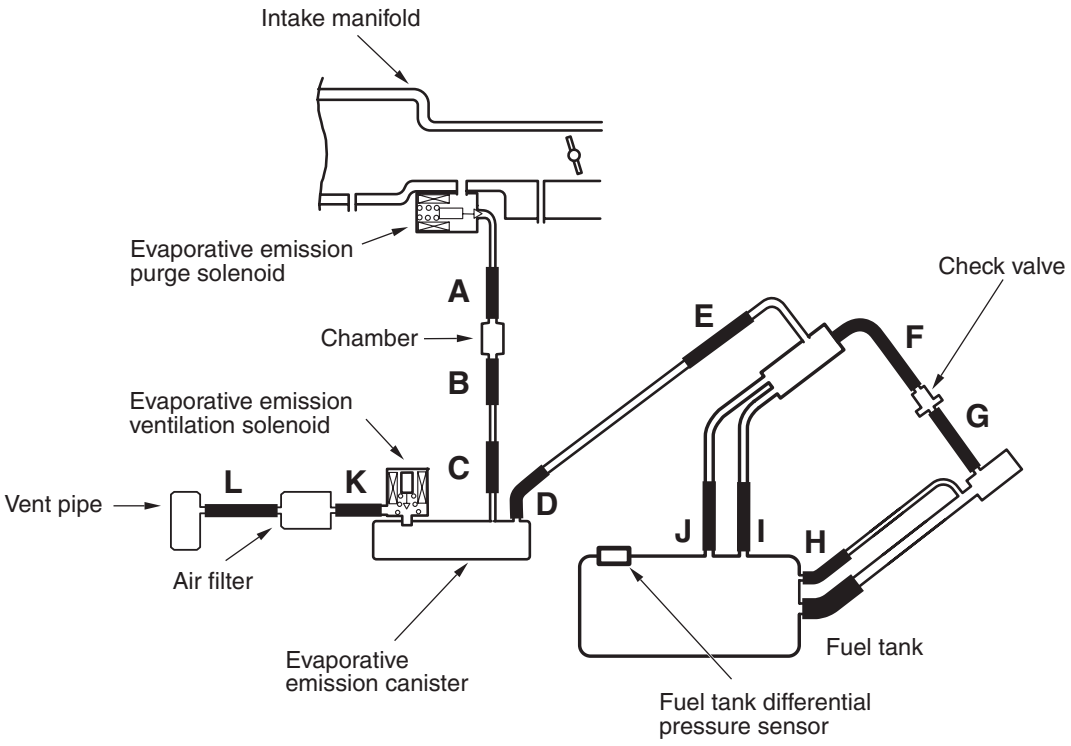
Q: Is DTC P0452 set?

YES : Repeat the troubleshooting.

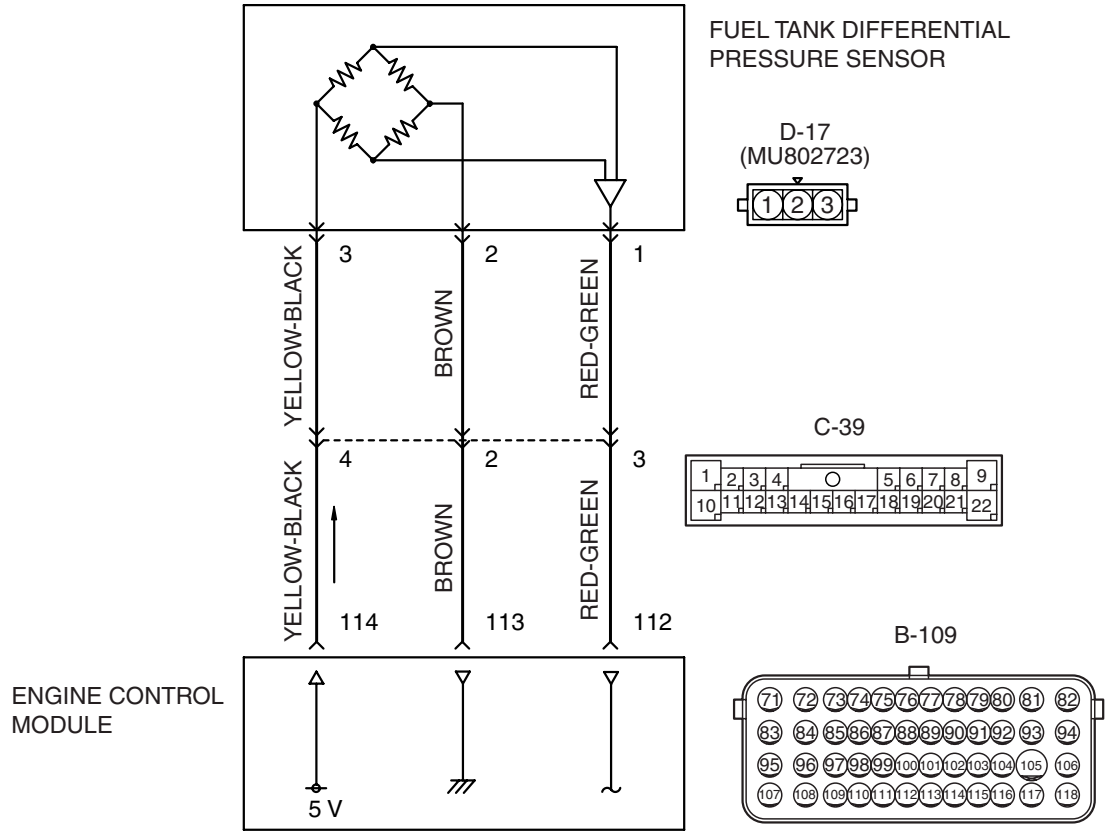
NO : The procedure is complete.

DTC P0453: Evaporative Emission System Pressure Sensor High Input

System diagram



FUEL TANK DIFFERENTIAL PRESSURE SENSOR CIRCUIT



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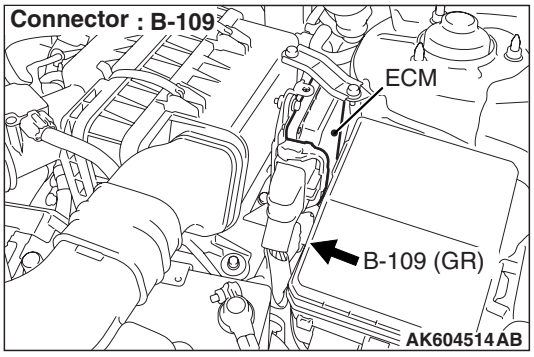
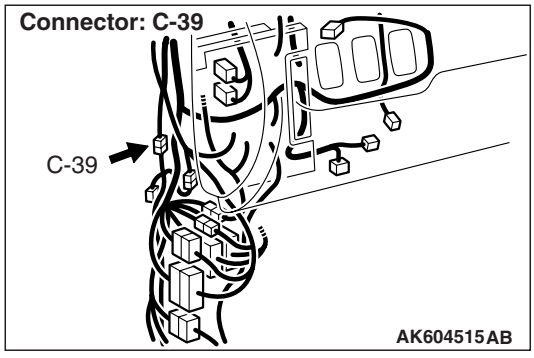
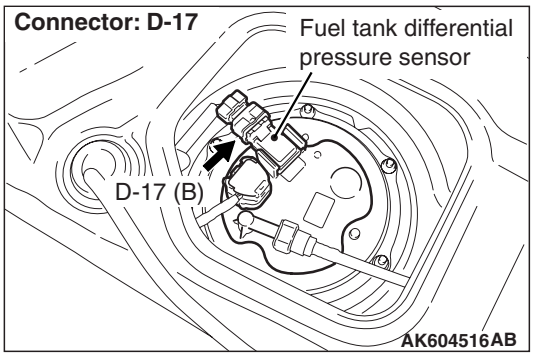




TSB Revision



CIRCUIT OPERATION

- The ECM (terminal No. 114) supplies a 5 volts reference voltage to the fuel tank differential pressure sensor (terminal No. 3). The ECM (terminal No. 113) supplies a ground to the fuel tank differential pressure sensor (terminal No. 2).
- The ECM (terminal No. 112) receives a voltage signal proportional to the pressure in the fuel tank from the fuel tank differential pressure sensor (terminal No. 1).

TECHNICAL DESCRIPTION

- To determine whether the fuel tank differential pressure sensor is defective, the ECM monitors the fuel tank differential pressure sensor output voltage.
- The ECM judges if the fuel tank differential pressure sensor output voltage is normal.

NOTE: In rare cases, this DTC may be also set under some fuel and driving conditions regardless of the fuel pressure sensor output voltage when the fuel system is clogged.

DESCRIPTIONS OF MONITOR METHODS

- Compare purge solenoid status with fuel tank differential pressure sensor output voltage.

MONITOR EXECUTION

- Continuous.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

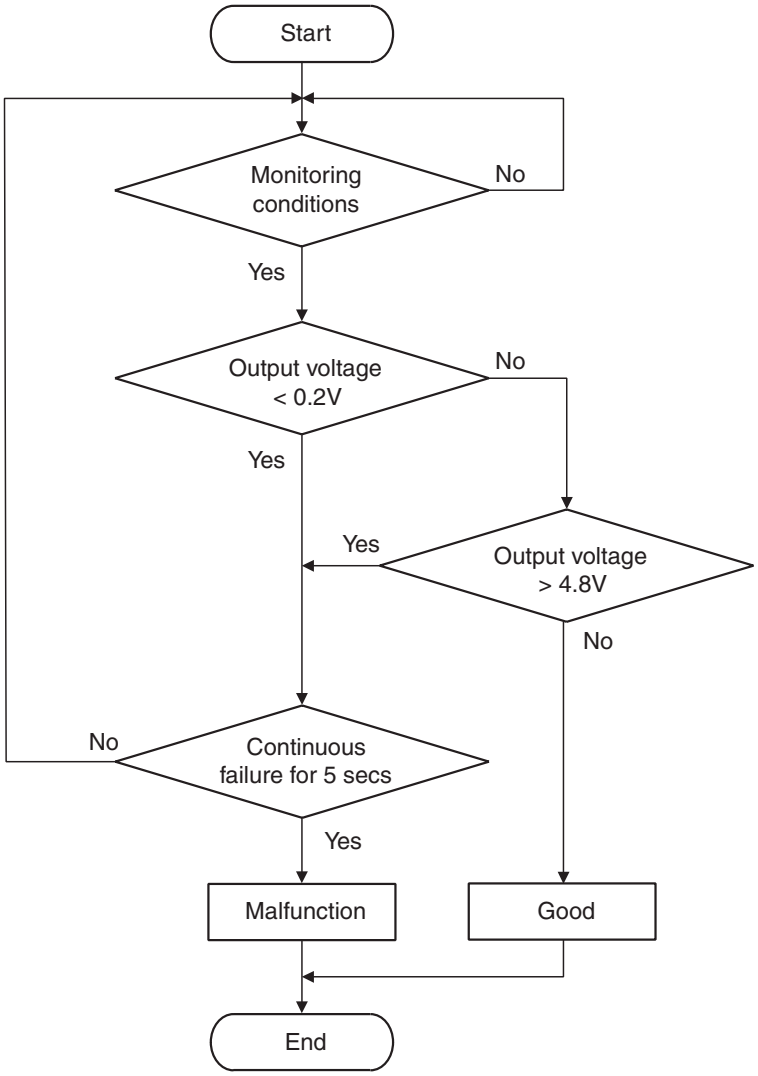
- Evaporative emission purge solenoid monitor
- Evaporative emission ventilation solenoid monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor
- Accelerator pedal position sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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Check Conditions

- 2 seconds or more have passed since the starting sequence was completed.
- The fuel temperature is 36° C (97° F) or less.
- Remaining fuel level is 85 percent or less when the engine is started.

Judgement Criteria

- The fuel tank differential pressure sensor output voltage remains 4.8 volts or greater for 5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 24 P.13A-10.

TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Connector damage.
- Harness damage.
- Fuel tank differential pressure sensor failed.
- ECM failed.

OVERVIEW OF TROUBLESHOOTING

- DTC P0453 can be set by a faulty fuel tank differential pressure sensor or related circuit, or ECM failure.
- To check for system blockage, do a performance test which uses a mechanical vacuum gauge and scan tool MB991958 set on the fuel tank differential pressure sensor (52: Fuel tank differential PRS. SNSR). The mechanical gauge reading is used to verify scan tool reading. A comparison of the mechanical gauge with the reading on scan tool MB991958 will locate a problem in the system.

DIAGNOSIS

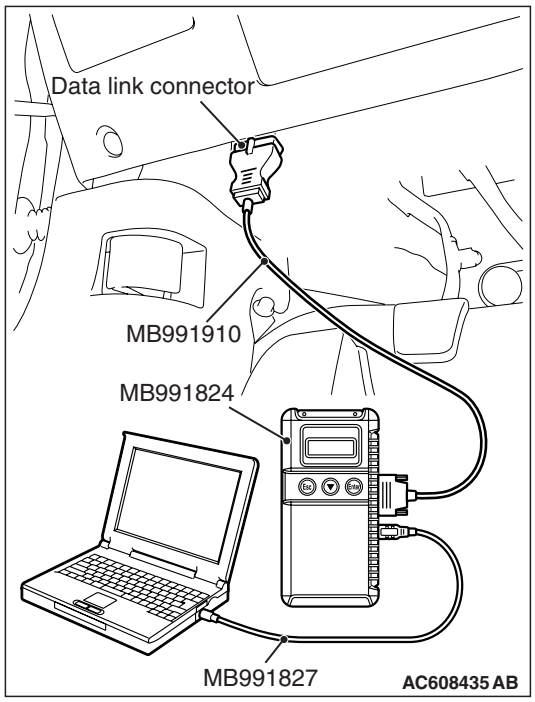
Required Special Tools:

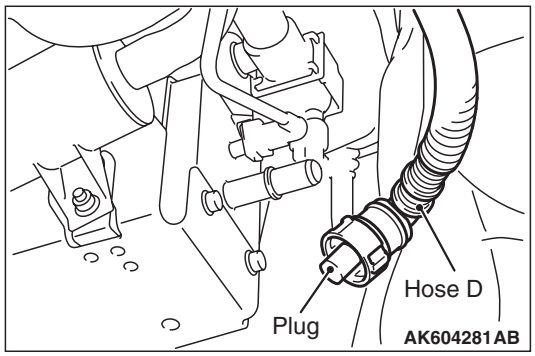
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A

STEP 1. Using scan tool MB991958, check data list item 52: Fuel Tank Differential Pressure Sensor.

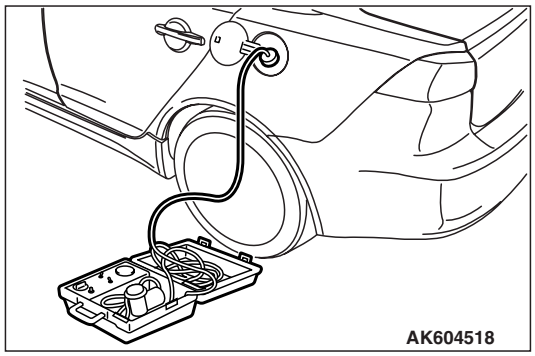
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.





(2) Disconnect hose D from the evaporative emission canister, and plug the hose.
(3) Turn the ignition switch to the "ON" position.
(4) Remove the fuel cap.
(5) Set scan tool MB991958 to the data reading mode.
- Item 52, Fuel Tank Differential Pressure Sensor.
  - The fuel tank pressure reading on the scan tool should be 1,500 to 3,500 mV.



(6) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382) and pressurize the fuel tank.
- The fuel tank pressure reading should increase.

(7) Turn the ignition switch to the "LOCK" (OFF) position. Then disconnect scan tool MB991958.
(8) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(9) Connect hose D to the evaporative emission canister.

Q: Does the output voltage of differential pressure sensor increase when pressure the fuel tank?

YES : It can be assumed that this malfunction is intermittent (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13).

NO : Go to Step 2 .

TSB Revision

STEP. 2 Check harness connector B-109 at ECM and harness connector D-17 at fuel tank differential pressure sensor for damage.

Q: Is the harness connector in good condition?

YES : Then go to Step 3 .

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5 .

STEP 3. Check for open circuit or harness damage between fuel tank differential pressure sensor connector D-17 and ECM connector B-109.

(1) Disconnect the connector D-17 and B-109 measure at the harness side.

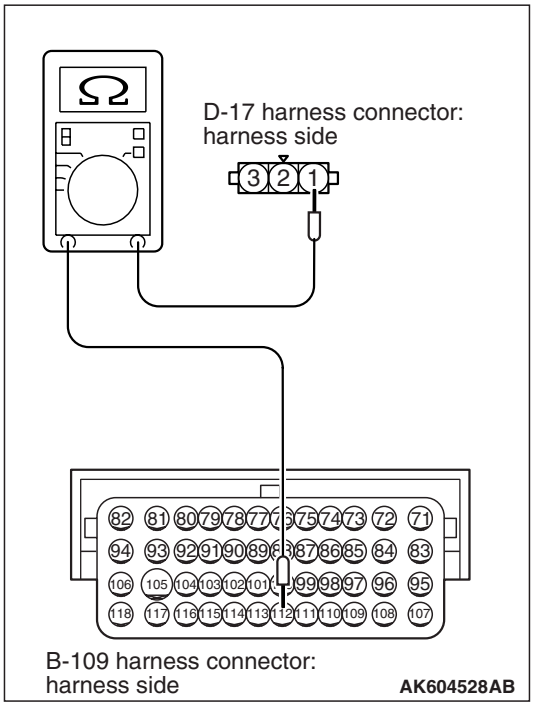
(2) Measure the resistance between connector D-17 (terminal No. 1) and connector B-109 (terminal No. 112).

- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 4 .

NO : Repair it. Then Go to Step 5 .



STEP 4. Replace the fuel tank differential pressure sensor.

(1) Replace the fuel tank differential pressure sensor.

(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function. OBD-II Drive Cycle. Pattern 23 P.13A-10.

(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0453 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5 .

NO : The inspection is complete.

TSB Revision

STEP 5. Perform the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

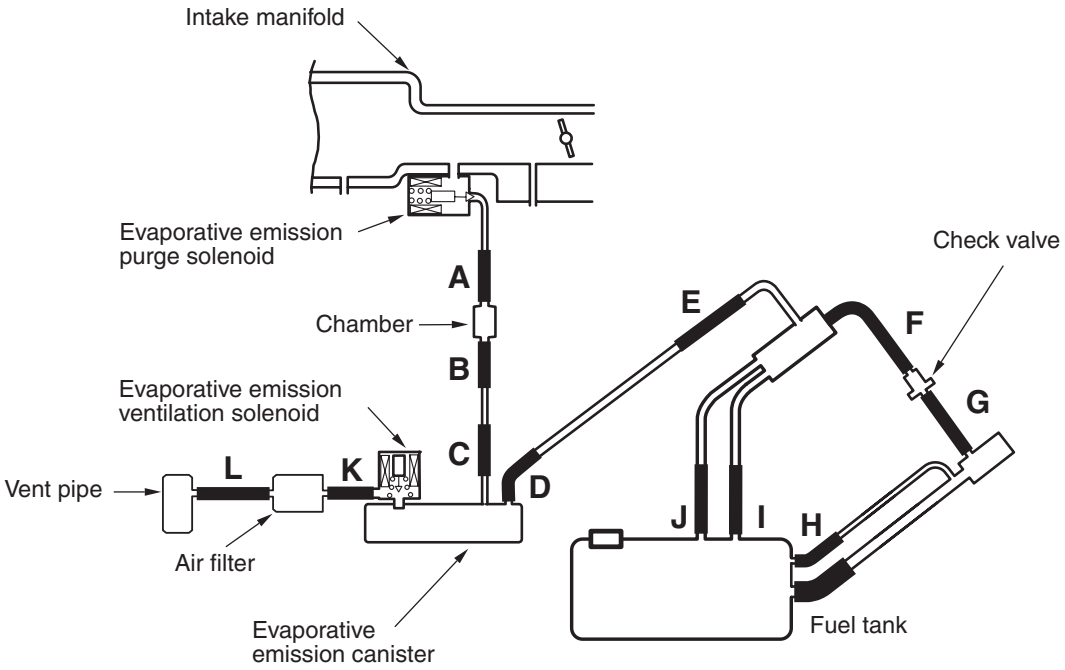
Q: Is DTC P0453 set?

YES : Repeat the troubleshooting.

NO : The procedure is complete.

DTC P0455: Evaporative Emission System Leak Detected (Gross Leak)

System diagram



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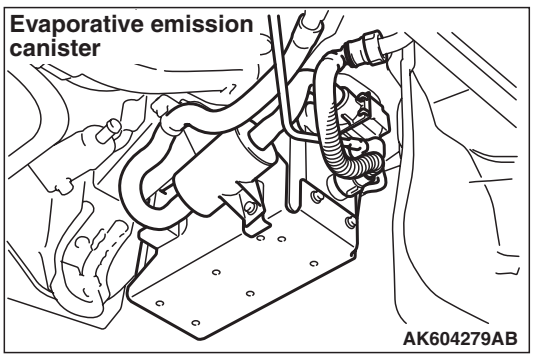
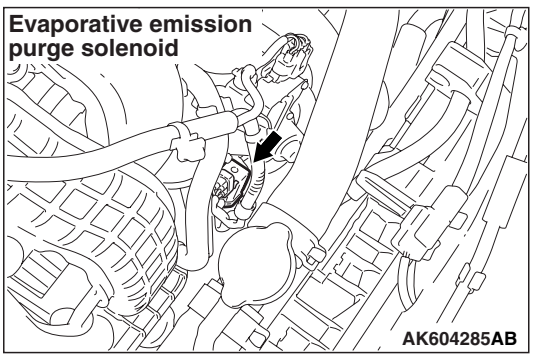
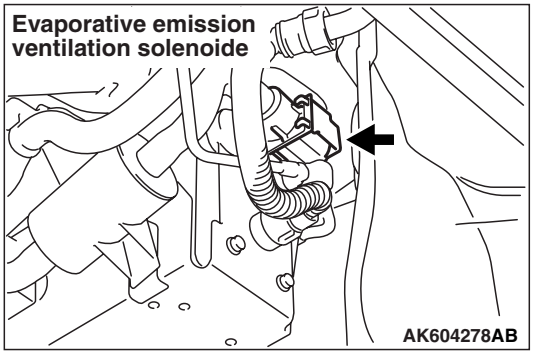




TSB Revision



TECHNICAL DESCRIPTION

- The fuel tank may be under a slight pressure or vacuum depending on the state of the Evaporative Emission (EVAP) System. The ECM monitors and responds to these pressure/vacuum changes. If the pressure/vacuum varies from the specified range, the ECM will set DTC P0455.
- The ECM energizes the evaporative emission ventilation solenoid to shut off the evaporative emission canister outlet port.
- The evaporative emission purge solenoid is activated to apply engine manifold vacuum to the EVAP system.
- When the fuel system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is turned "off" and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM determines whether there is a leak or clog in the fuel system by measuring the change in vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure is determined to be too high.

DESCRIPTIONS OF MONITOR METHODS

- Depressurizing EVAP system by intake manifold negative pressure is impossible within specified period.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

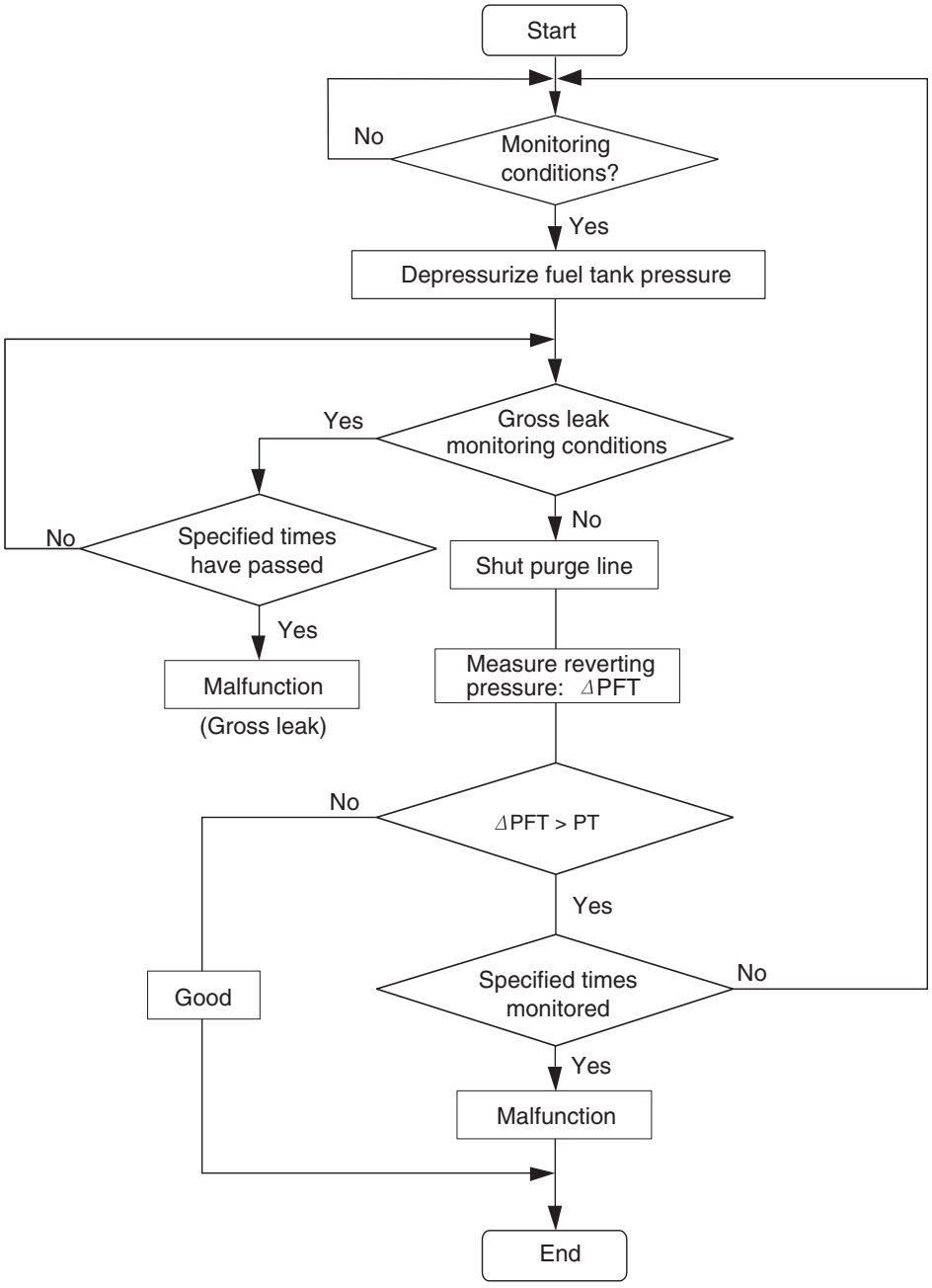
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



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DTC SET CONDITIONS

Check Conditions A: At Start up

- Intake air temperature is 36° C (97° F) or less upon engine start up.
- The engine coolant temperature is 36° C (97° F) or less upon engine start up.

Check Conditions B: For Test to Run

- The engine coolant temperature is 60° C (140° F) or greater and the fuel tank is 15 –40 percent full.
- The engine coolant temperature is 20° C (68° F) or greater and the fuel tank is 40 –85 percent full.
- The engine speed is greater than 1,594 r/min.
- Barometric pressure is greater than 76 kPa (11 psi).
- Volumetric efficiency is between 20 and 80 percent.

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- The fuel temperature is 36° C (97° F) or less.
- The fuel tank differential pressure sensor output voltage is 1 –4 volts.

Check Conditions C: For Test to Stop

- The intake air temperature is greater than 5° C (41° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 451 Pa (0.065 psi) or less and the amount of remaining fuel is 15 –40 percent of capacity upon engine start-up.
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure in the fuel tank rises to 324 Pa (0.047 psi) or less and the amount of remaining fuel is 40 –85 percent of capacity upon engine start-up.
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 150 seconds.

Judgment Criteria

- The fuel tank internal pressure is 1961 Pa (0.284 psi) or more after the evaporative emission purge solenoid valve has been driven when the fuel tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 5 P.13A-10.

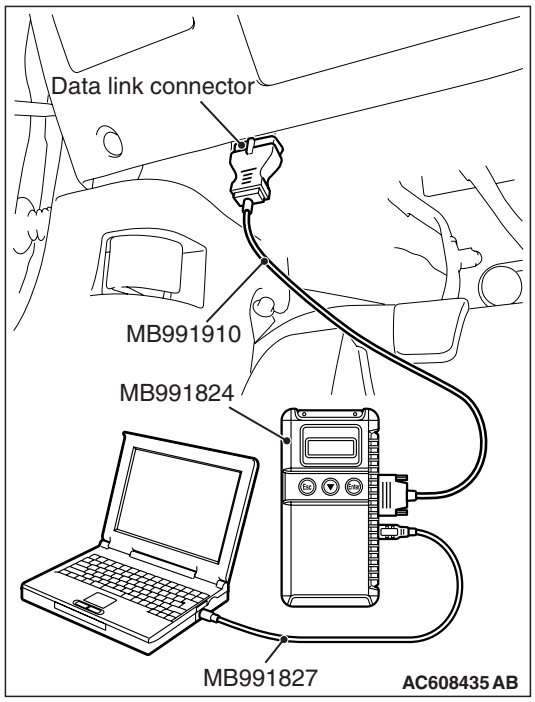
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Fuel overflow limiter valve failed.
- Purge line or vapor line is clogged.
- Fuel tank, purge line or vapor line seal failed.
- Evaporative emission purge solenoid valve failed.
- Evaporative emission ventilation solenoid valve failed.
- Fuel tank differential pressure sensor failed.
- Evaporative emission canister seal is faulty.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

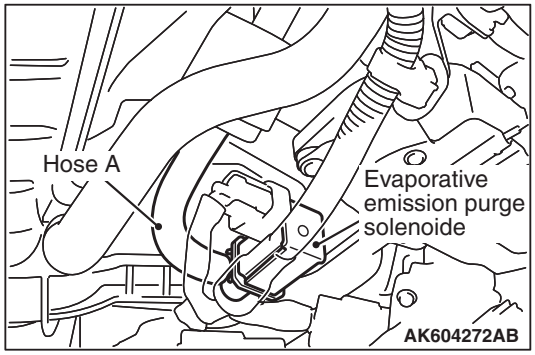
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-46. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1.

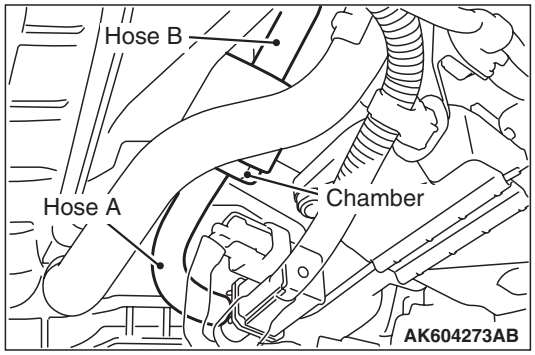


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 14.

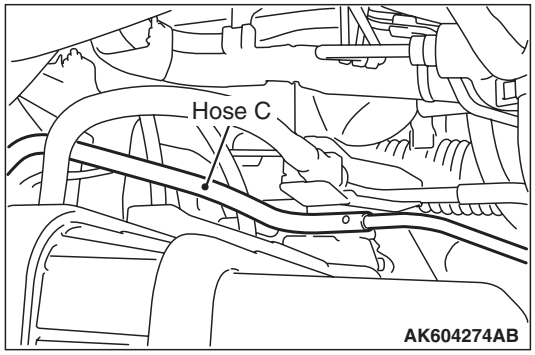


STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose or chamber. Then go to Step 14.

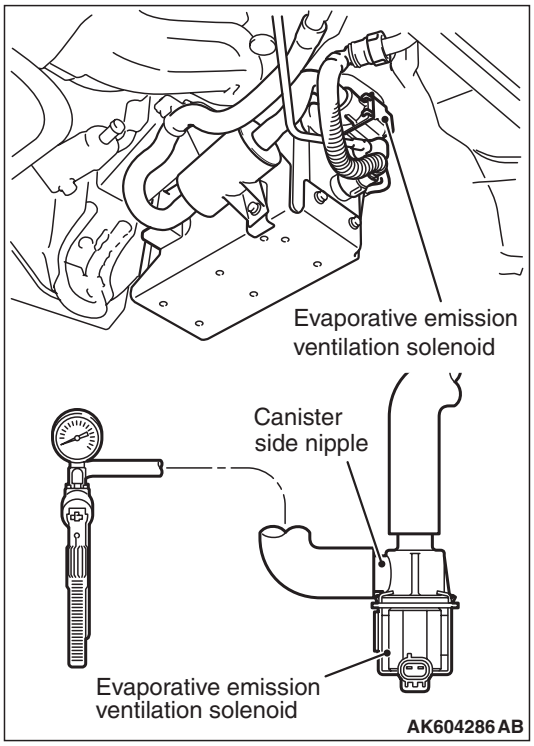


STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5.
NO : Replace any damaged hose. Then go to Step 14.



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

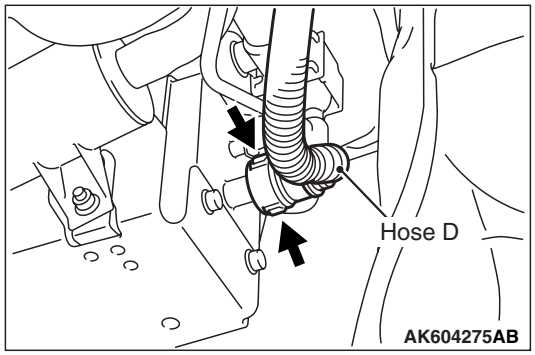
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

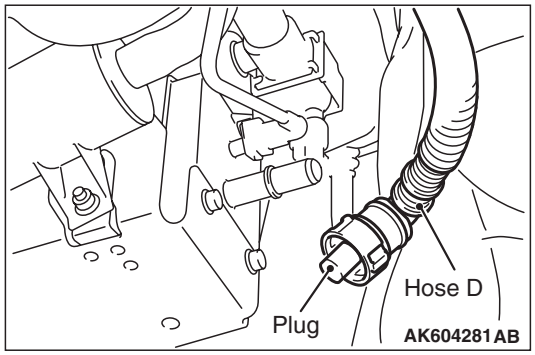
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-87).Then go to Step 14.

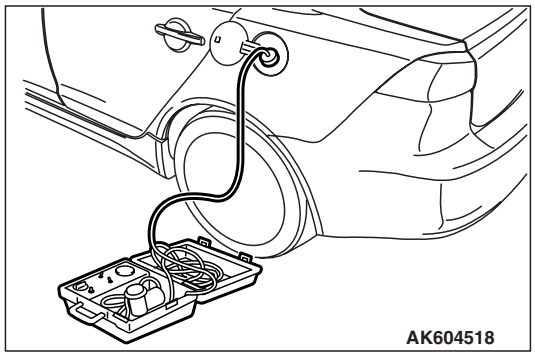
STEP 6. Pressure test the evaporative emission system lines from hoses D to J.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Plug the disconnected end of hose D.
(3) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(4) Remove the fuel cap.



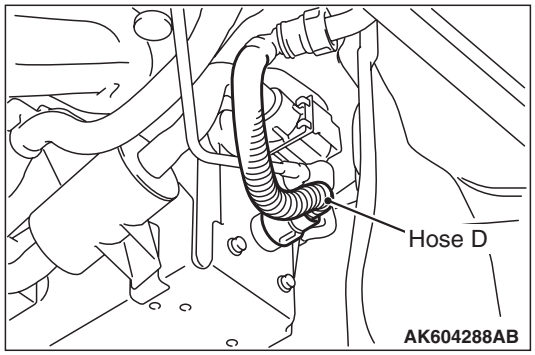
(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) Pressure test the system to determine whether any leaks are present.

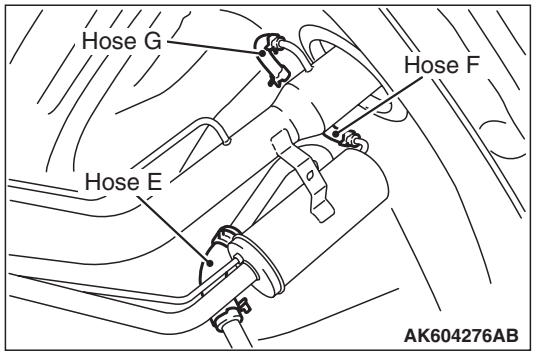
NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 12.
NO : Go to Step 7.





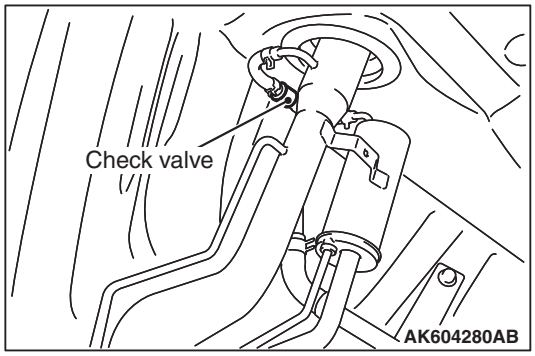
STEP 7. Check for leaks in evaporative emission hoses D through G.

Use a hand vacuum pump to test each hose from hose D to hose G.

Q: Do the hoses hold vacuum?

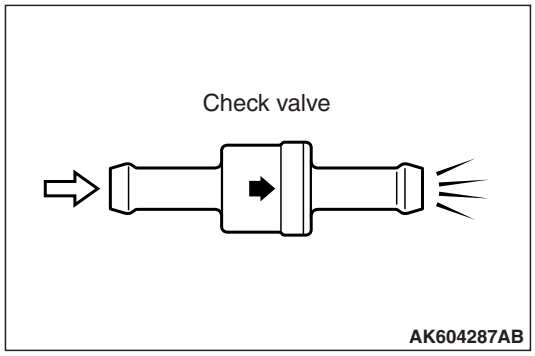
YES : Go to Step 8.

NO : Replace any damaged hose. Then go to Step 14.



STEP 8. Test check valve.

(1) Check valve is a one-way check valve.

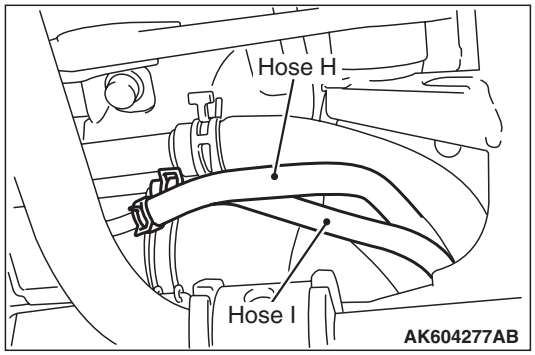


(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 9.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



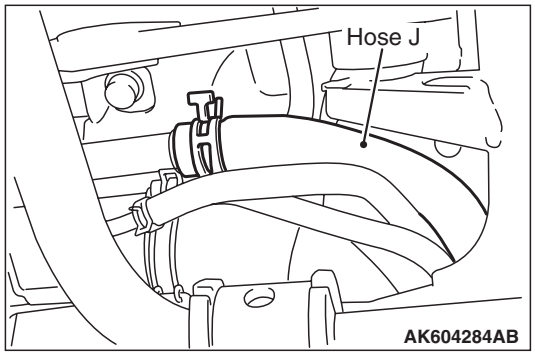
STEP 9. Check for leaks in evaporative emission hoses H and I.

Use a hand vacuum pump to test each hose H and I.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

NO : Replace any damaged hose. Then go to Step 14.



STEP 10. Check for leaks in evaporative emission hose J.

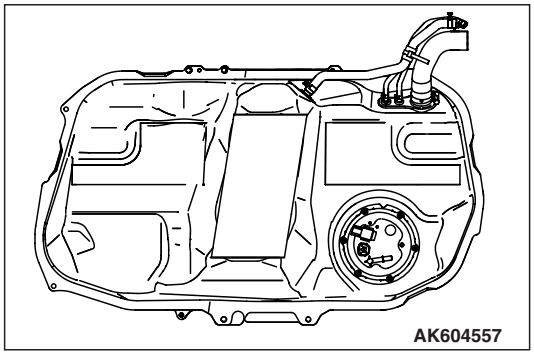
(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9).

(2) Use the hand vacuum pump to check hose J.

Q: Does the hose hold vacuum?

YES : Go to Step 11.

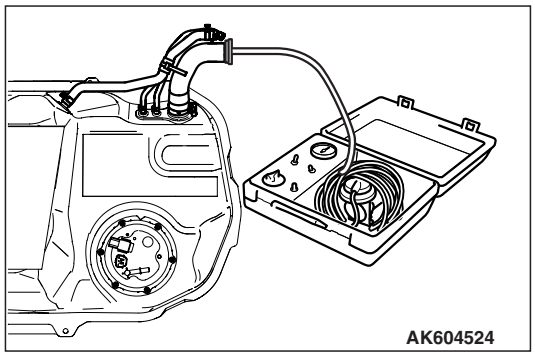
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



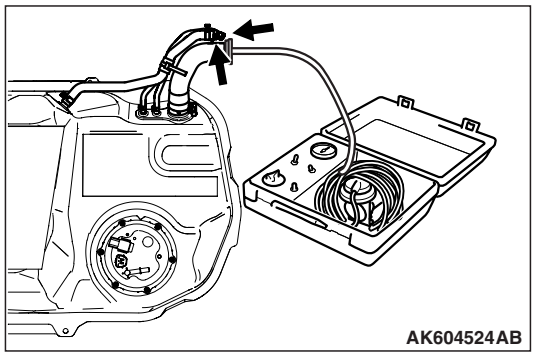
STEP 11. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.


AK604524

(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.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(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

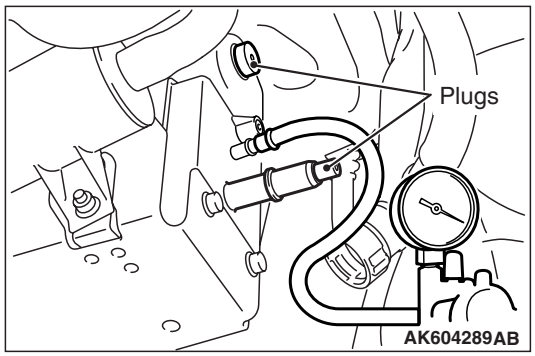
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14 .

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Go to Step 14

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 13.

STEP 12. Check the evaporative emission canister for vacuum leaks.



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(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 13.

NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-87). Then go to Step 14 .

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 14 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14 .

STEP 14. Perform the OBD-II drive cycle.

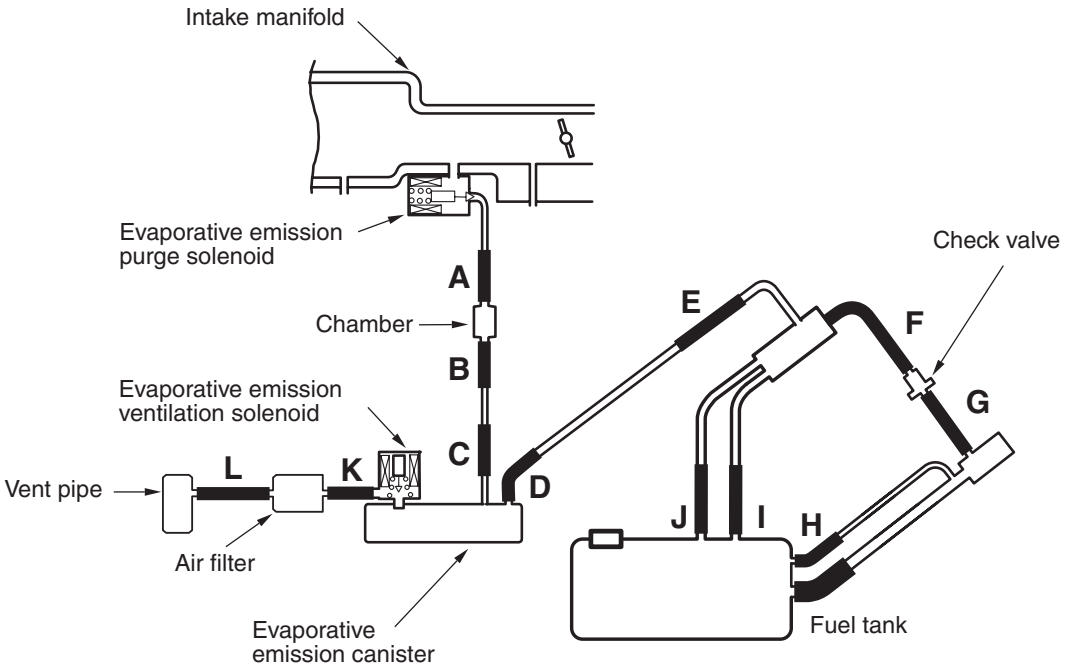
(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 5 P.13A-10).
(2) Read the DTC.

Q: Is DTC P0455 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0456: Evaporative Emission System Leak Detected (Very Small Leak)

System diagram



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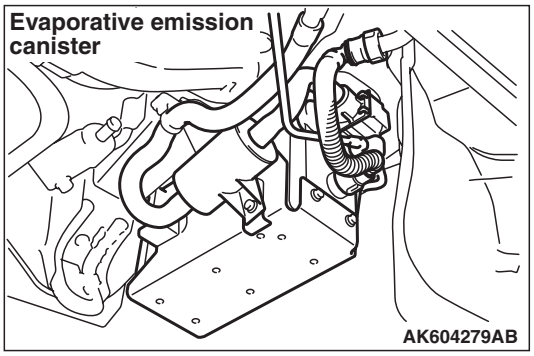

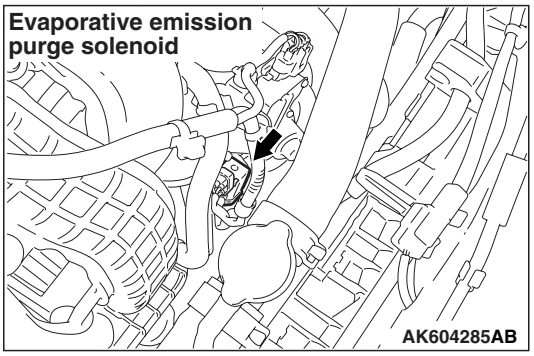

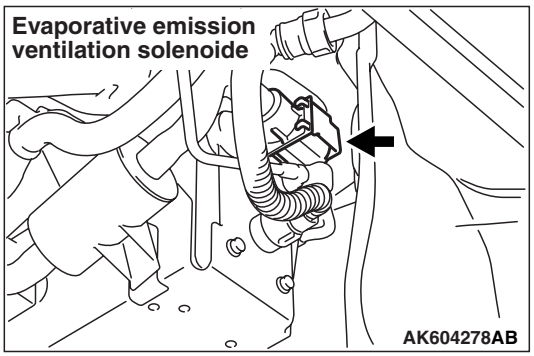

TECHNICAL DESCRIPTION

- The ECM monitors the Evaporative Emission (EVAP) System pressure.
- The ECM controls the evaporative emission ventilation solenoid. It closes the evaporative emission ventilation solenoid to seal the evaporative emission canister side of the system.

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- The evaporative emission purge solenoid is opened to allow manifold vacuum to create low pressure (vacuum) in the EVAP system.
- When the EVAP system develops a vacuum of 2 kPa (0.29 psi), the evaporative emission purge solenoid is closed and the fuel system vacuum is maintained at 2 kPa (0.29 psi).
- The ECM determines whether there is a leak in the EVAP system by monitoring the vacuum inside the fuel tank.
- The test is stopped when fuel vapor pressure exceeds predetermined limits.

DESCRIPTIONS OF MONITOR METHODS

- Measure reverting pressure after depressurizing by intake manifold negative pressure and detect malfunction if reverting pressure rises largely.

MONITOR EXECUTION

- Once per driving cycle.

MONITOR EXECUTION CONDITIONS (OTHER MONITOR AND SENSOR)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

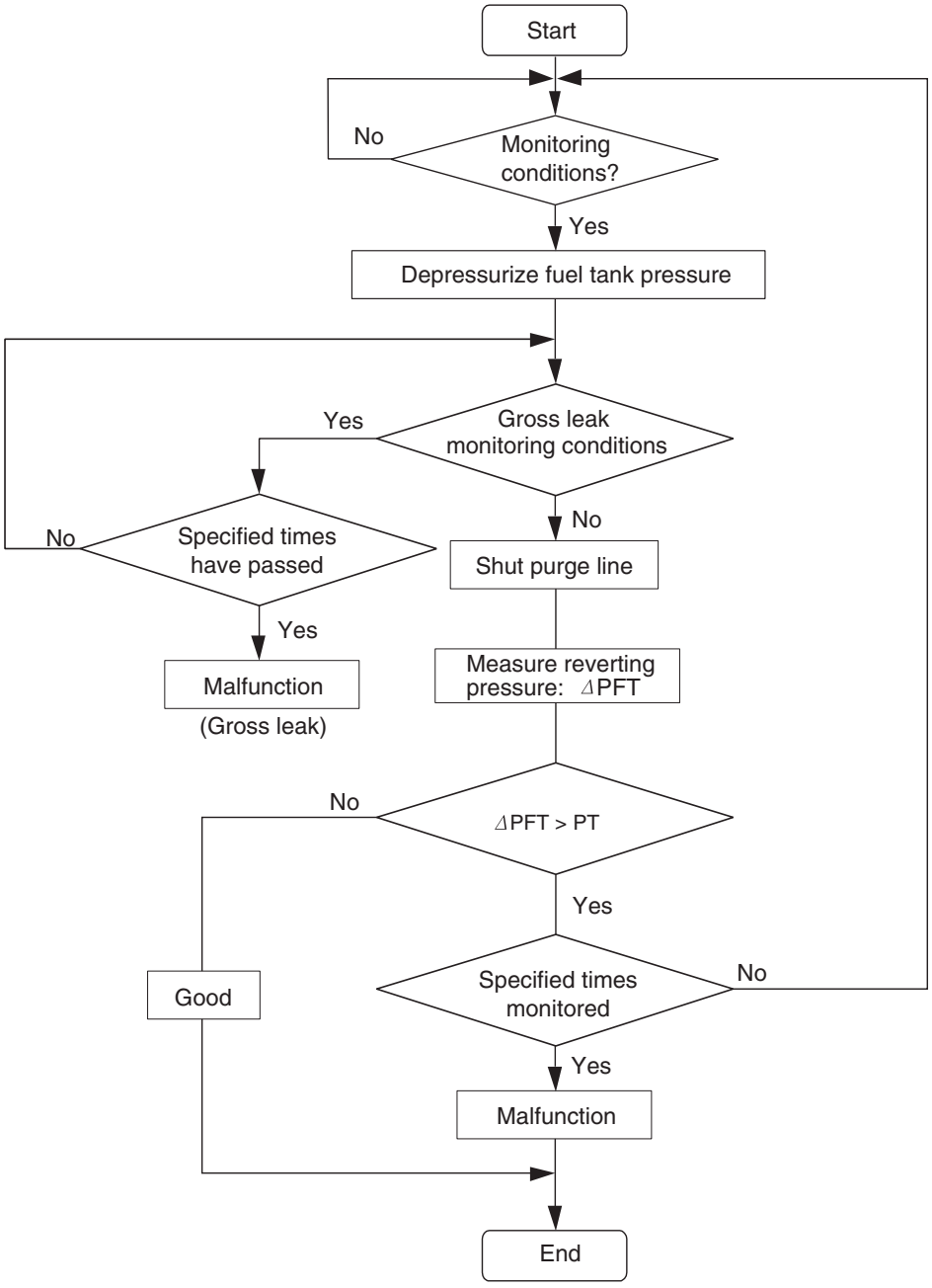
- Evaporative emission purge solenoid monitor
- Evaporative emission purge system monitor
- Fuel tank differential pressure sensor monitor
- Evaporative emission ventilation solenoid monitor
- Fuel level sensor monitor
- Fuel temperature sensor monitor

Sensor (The sensors below are determined to be normal)

- Mass airflow sensor
- Barometric pressure sensor
- Intake air temperature sensor
- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart (Monitor Sequence)



AK604523AB

Check Conditions

Conditions A: At Start up

- Intake air temperature is 36° C (97° F) or less when the engine is started.
- The engine coolant temperature is 36° C (97° F) or less when the engine is started.
- Remaining fuel amount is 40 –85 percent of capacity.

Conditions B: For Test to Run

- Barometric pressure is greater than 76 kPa (11 psi).
- The fuel temperature is 33° C (91° F) or less.
- Fuel tank differential pressure sensor output voltage is 1 to 4 volts.

Conditions C: For Test to Stop

- Engine coolant temperature is greater than 20° C (68° F).

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- Intake air temperature is greater than -10° C (14° F).
- When the evaporative emission purge solenoid and evaporative emission ventilation solenoid are closed, the pressure rises in the fuel tank is less than 324 Pa (0.047 psi).
- 10 seconds have elapsed from the start of the previous monitoring.
- Monitoring time: 10 –14 minutes.

Judgement Criteria

- Internal pressure of the fuel tank has changed more than 1,177 –1,497 Pa (0.177 –0.217 psi) in 128 seconds after the tank and vapor line were closed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 6 P.13A-10.

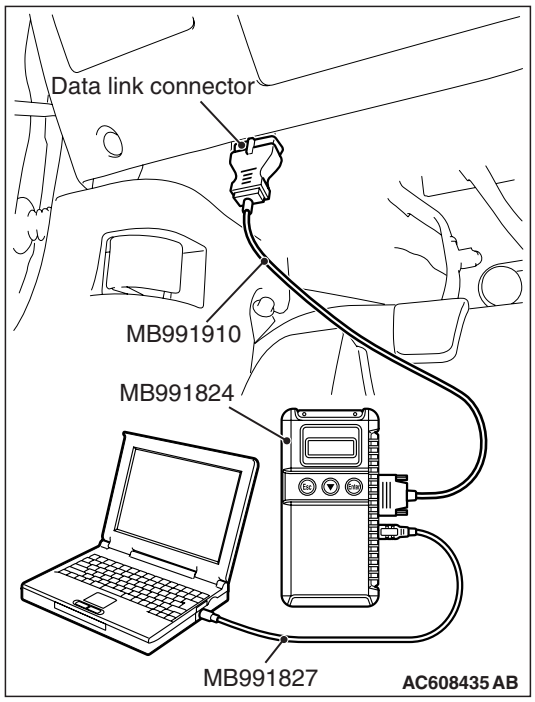
TROUBLESHOOTING HINTS (THE MOST LIKELY CAUSES FOR THIS CODE TO BE SET ARE:)

- Loose fuel cap.
- Fuel cap relief pressure is incorrect.
- Malfunction of the evaporative emission canister seal.
- Malfunction of the fuel tank, purge line or vapor line seal.
- Malfunction of the evaporative emission ventilation solenoid.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: M.U.T.-III USB Cable
  - MB991910: M.U.T.-III Main Harness A



STEP 1. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.**
- **During this test, the ECM will automatically increase the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

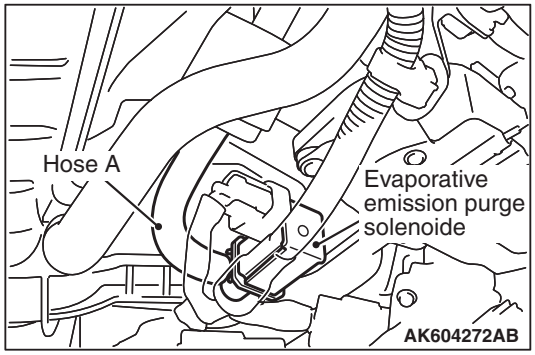
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTCs using scan tool MB991958.
(4) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(5) Start the engine.
(6) Select "System Test."
(7) Select "Evap Leak Mon."
(8) During this test, keep the accelerator pedal at the idle position.
(9) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(10) Turn the ignition switch to the "LOCK" (OFF) position, and disconnect scan tool MB991958.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : A malfunction has been detected during the monitor test. Refer to the Diagnostic Trouble Code Chart and diagnose any other DTCs that are set P.13A-46. If no other DTC's have been set, go to Step 2.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Explain to the customer that an improperly tightened fuel cap can cause the MIL to illuminate. Return the vehicle to the customer.

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 1 .

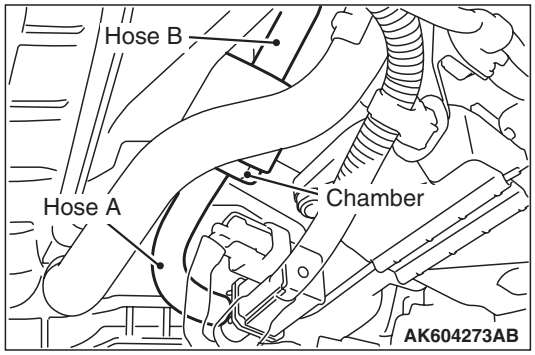


STEP 2. Check the evaporative emission purge solenoid for leaks.

(1) Disconnect hose A from the evaporative emission purge solenoid.
(2) Connect the hose of the hand vacuum pump to the chamber side nipple of the evaporative emission purge solenoid.
(3) Use the hand vacuum pump to confirm that the evaporative emission purge solenoid holds vacuum.
(4) Connect hose A to the evaporative emission purge solenoid.

Q: Does the evaporative emission purge solenoid hold vacuum?

YES : Go to Step 3.
NO : Replace the evaporative emission purge solenoid. Then go to Step 14.

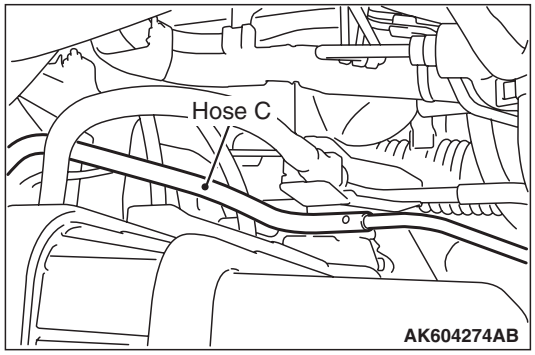


STEP 3. Check for leaks in evaporative emission hose A, chamber and hose B.

(1) Use a hand vacuum pump to check hose A, chamber and hose B.

Q: Do the hoses and chamber hold vacuum?

YES : Go to Step 4.
NO : Replace any damaged hose or chamber. Then go to Step 14.

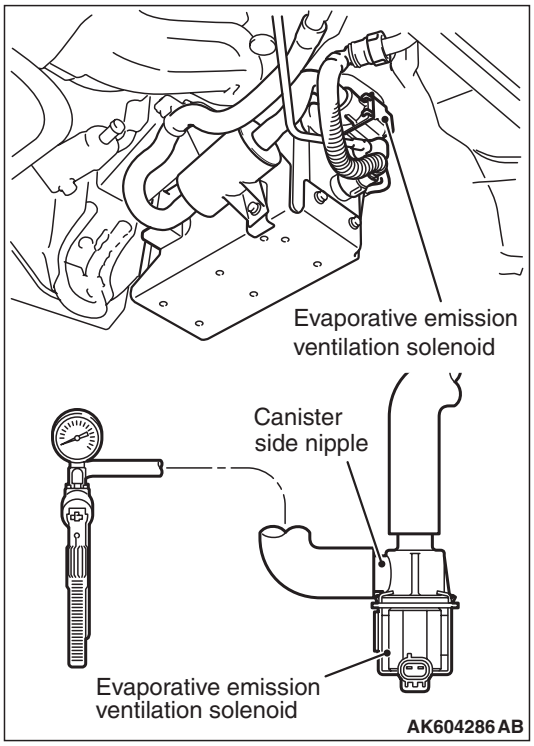


STEP 4. Check for leaks in evaporative emission hose C.

(1) Use a hand vacuum pump to check hose C.

Q: Does hose C hold vacuum?

YES : Go to Step 5.
NO : Replace any damaged hose. Then go to Step 14.



STEP 5. Using scan tool MB991958, check actuator test item 15: Evaporative emission ventilation solenoid.

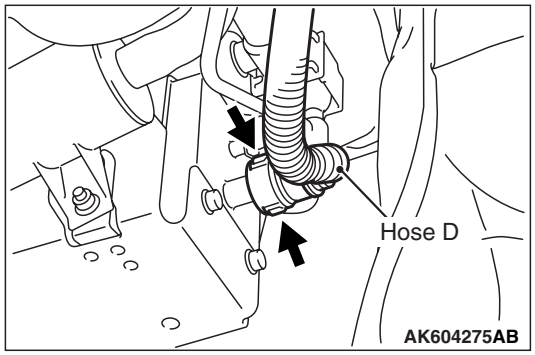
(1) Remove the canister cover.
(2) Remove the evaporative emission ventilation solenoid. Do not disconnect the connector.
(3) Connect the hose of the hand vacuum pump to the canister side nipple of the evaporative emission ventilation solenoid.
(4) Turn the ignition switch to the "ON" position.
(5) Set scan tool MB991958 to actuator test mode.
- Item 15: Evaporative Emission Ventilation Solenoid.
  - While the evaporative emission ventilation solenoid is energized, operate the hand vacuum pump and confirm that the solenoid holds vacuum.

(6) Turn the ignition switch to the "LOCK" (OFF) position.
(7) Disconnect the hand vacuum pump, and reinstall the evaporative emission ventilation solenoid.
(8) Reinstall the canister cover.

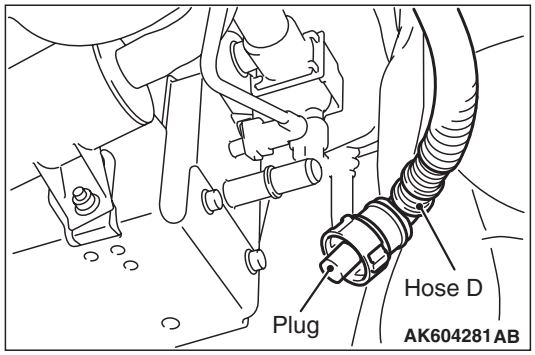
Q: Did the evaporative emission ventilation solenoid hold vacuum?

YES : Go to Step 6.
NO : Replace the evaporative emission ventilation solenoid (Refer to GROUP 17, Evaporative emission canister and fuel tank pressure relief valve removal and installation P.17-87).Then go to Step 14.

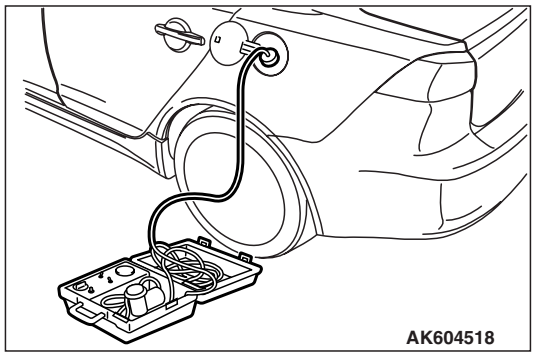
STEP 6. Pressure test the evaporative emission system lines from hoses D to J.



(1) Disconnect hose D from the canister while holding the release buttons indicated in the illustration pressed by fingers.



(2) Install hose D after having installed plug from canister in a nipple part of illustration so that there is not a leak.
(3) Confirm that the evaporative emission system pressure pump (Miller number 6872A) is operating properly. Perform the self-test as described in the pump manufacturer's instructions.
(4) Remove the fuel cap.



(5) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel tank filler tube by using fuel tank adapter (MLR-8382).
(6) Pressure test the system to determine whether any leaks are present.

NOTE: The "Pressure test" in this procedure refers to the I/M240 Simulation Test. The eight steps of this test are described in the manufacturer's instructions for the evaporative emission system pressure pump, Miller number 6872A.

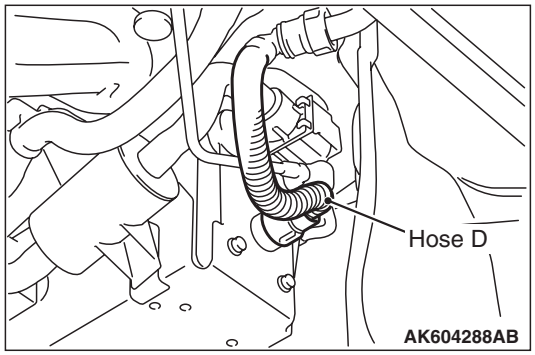
(7) Remove the evaporative emission system pressure pump (Miller number 6872A) and the fuel tank adapter (MLR-8382), and reinstall the fuel cap.
(8) Connect hose D to the evaporative emission canister.

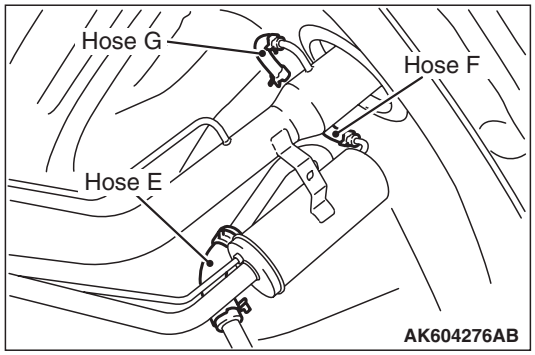
Q: Is the evaporative emission system line free of leaks?

YES : Go to Step 12.
NO : Go to Step 7.

STEP 7. Check for leaks in evaporative emission hoses D through G.

Use a hand vacuum pump to test each hose from hose D to hose G.





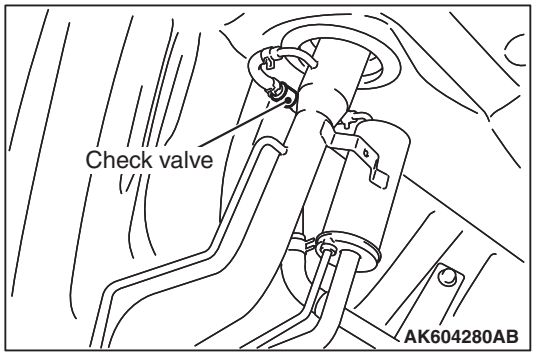
Q: Do the hoses hold vacuum?

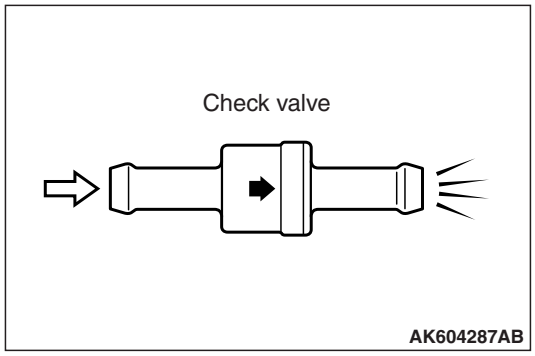
YES : Go to Step 8.

NO : Replace any damaged hose. Then go to Step 14.

STEP 8. Test check valve.

(1) Check valve is a one-way check valve.



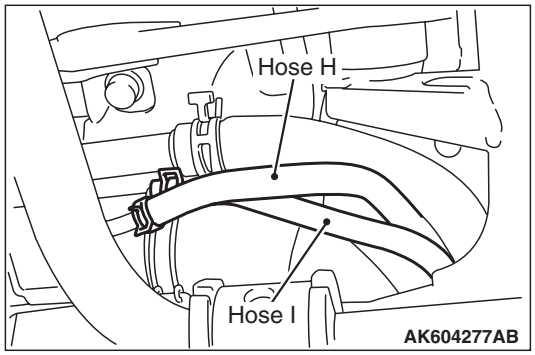


(2) Check valve should allow air to flow in only one direction.

Q: Does check valve allow air to pass in one direction only?

YES : Go to Step 9.

NO : Replace check valve, and reinstall the fuel tank filler tube protector (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



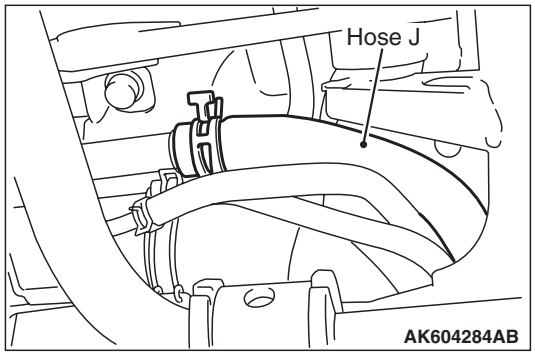
STEP 9. Check for leaks in evaporative emission hoses H and I.

Use a hand vacuum pump to test each hose H and I.

Q: Do the hoses hold vacuum?

YES : Go to Step 10.

NO : Replace any damaged hose. Then go to Step 14.



STEP 10. Check for leaks in evaporative emission hose J.

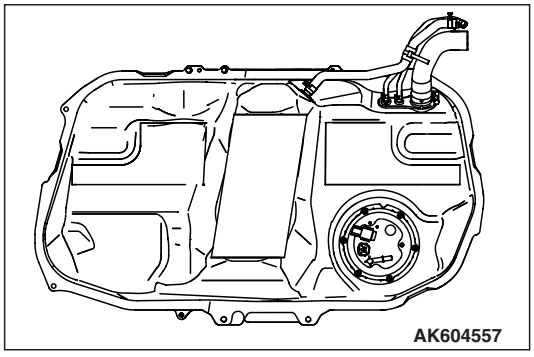
(1) Remove the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9).

(2) Use the hand vacuum pump to check hose J.

Q: Does the hose hold vacuum?

YES : Go to Step 11.

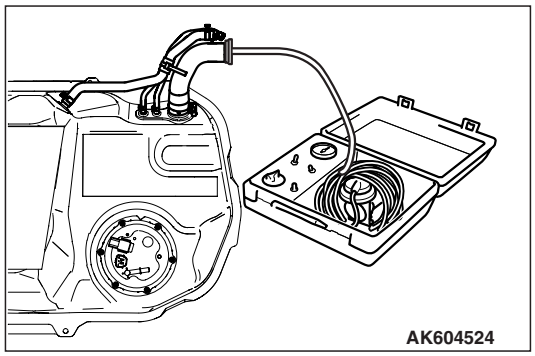
NO : Replace the hose and reinstall the fuel tank assembly (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.



STEP 11. Check for leaks in the fuel tank.

(1) Visually check for cracks or other leaks in the fuel tank.

NOTE: Carefully check the fuel pump module and the fuel tank differential pressure sensor installation in the fuel tank.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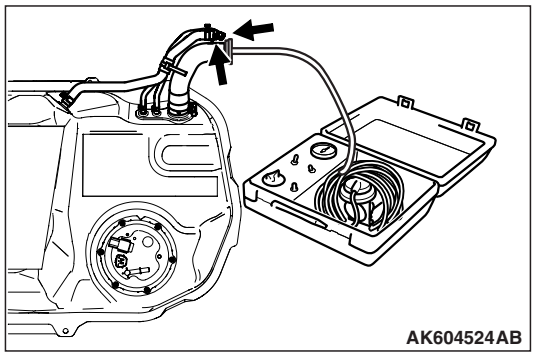
(2) Connect the evaporative emission system pressure pump (Miller number 6872A) to the fuel filler hose.


AK604524AB

(3) Plug the hose and the nipple shown in the illustration.

NOTE: If these items are not securely plugged now, the fuel could leak in the next step.

(4) Pressurize the fuel tank with the evaporative emission system pressure pump.
(5) In the pressurized state, check for leaks by applying a soapy water solution to each section and look for bubbles.

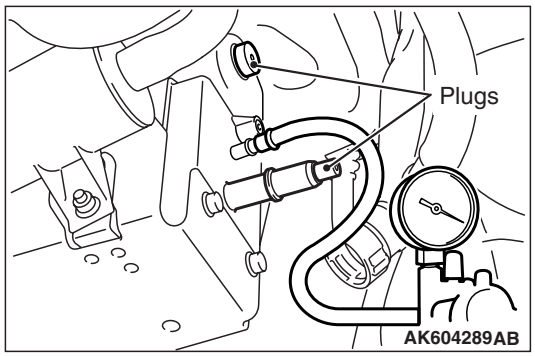
Q: Are any leaks found?

YES <When there is a leak from the attachment points of the fuel pump module, fuel tank differential pressure sensor, fuel level sensor or leveling valve.> : Reassemble the leaked parts and check again that there are no leaks. Then reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 14.

YES <When there is a leak from the fuel tank.> : Replace the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Go to Step 14

NO : When there is no leak, reinstall the fuel tank (Refer to GROUP 13B, Fuel Tank P.13B-9). Then go to Step 13.

STEP 12. Check the evaporative emission canister for vacuum leaks.



AK604289AB

(1) Connect a hand vacuum pump to the evaporative emission canister and plug the other nipples.
(2) Apply a pressure on the hand vacuum pump, and confirm that air is maintained.
(3) Disconnect the hand vacuum pump and remove the plugs.

Q: Is the evaporative emission canister in good condition?

YES : Go to Step 13.

NO : Replace the evaporative emission canister (Refer to GROUP 17, Evaporative Emission Canister and Fuel Tank Pressure Relief Valve P.17-87). Then go to Step 14.

STEP 13. Using scan tool MB991958, check the evaporative emission system monitor test.

⚠ CAUTION

- **During this test, the ECM automatically increases the engine speed to 1,600 r/min or greater. Check that the transaxle is set to "P" position.**

(1) Turn the ignition switch to the "ON" position.
(2) Erase the DTCs using scan tool MB991958.
(3) Check that the fuel cap is securely closed (Tighten until three clicks are heard).
(4) Start the engine.
(5) Select "System Test."
(6) Select "Evap Leak Mon."
(7) During the test, keep the accelerator pedal at the idle position.
(8) Keep the engine speed and engine load within the specified range. When the monitor test starts, the "In Progress" item on scan tool MB991958 will change from "NO" to "YES".
(9) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is "Evap Leak Mon. Completed. Test Failed and DTCs Set" displayed on scan tool MB991958?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.

NO <"Evap Leak Mon. Completed. Test Passed" is displayed on scan tool MB991958.> : The evaporative emission system is working properly at this time. Go to Step 14 .

NO <"Evap Leak Mon. Discontinued. Retest again from the first" is displayed on scan tool MB991958.> : The EVAP monitor has been interrupted during the test. Turn the ignition switch to the "LOCK" (OFF) position once, and repeat the monitoring from Step 14 .

STEP 14. Perform the OBD-II drive cycle.

(1) Confirm the repair by performing the appropriate drive cycle (Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 6 P.13A-10).
(2) Read the DTC.

Q: Is DTC P0456 set?

YES : Repeat the troubleshooting.
NO : The procedure is complete.

DTC P0461: Fuel Level Sensor Circuit Range/Performance

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and seconds it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if change of fuel level sensor output voltage is small when sum of fuel injection is large.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

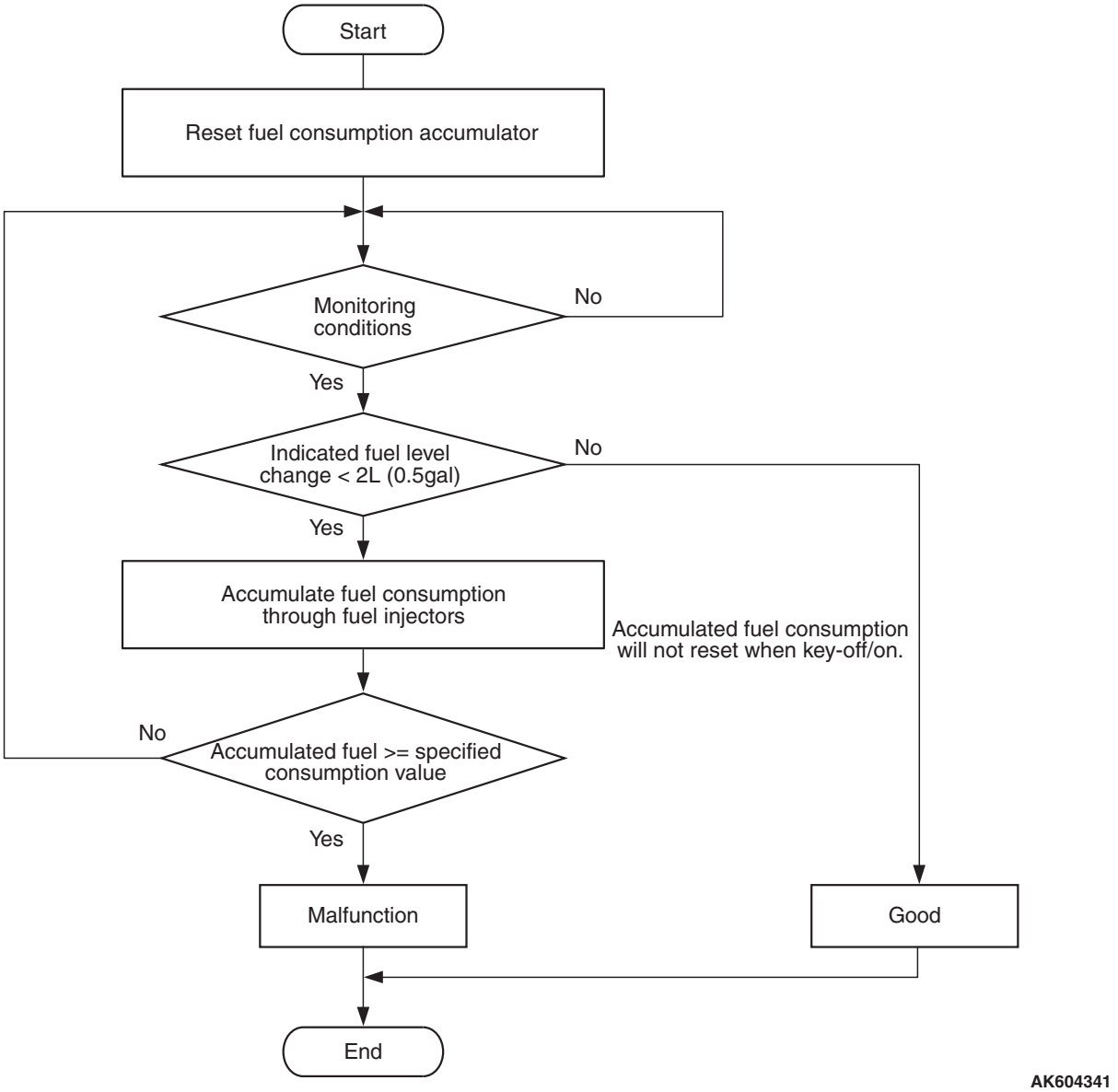
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



Check Condition, Judgement Criterion

- When the fuel consumption calculated from the operation time of the injector amounts to 20 liters (5.2 gal), the diversity of the amount of fuel in tank calculated from the fuel level sensor is 2 liters (0.5 gal) or less.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Combination meters assembly failed.
- Fuel level sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

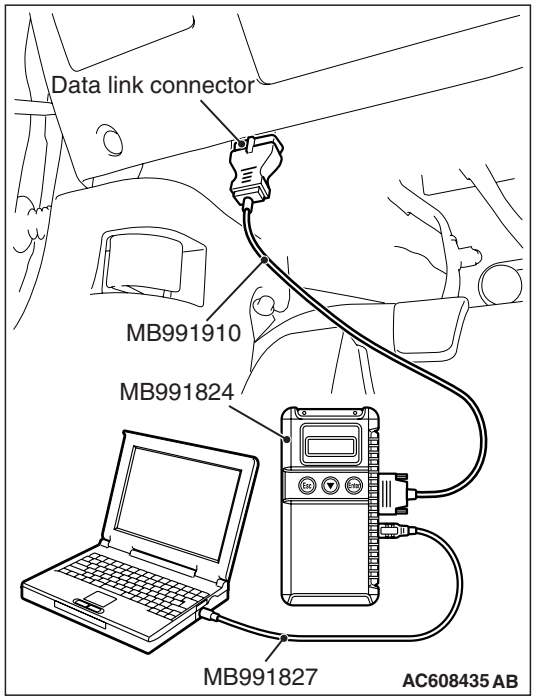
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the combination meter diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the combination meter-DTC set?

YES : Refer to GROUP 54A, Chassis Electrical – Combination Meter –Diagnosis Trouble Code Chart P.54A-23

NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC)

1. Turn the ignition switch to the "ON" position.
2. After the DTC has been deleted, read the DTC again.
3. Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0461 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC)

1. Turn the ignition switch to the "ON" position.
2. After the DTC has been deleted, read the DTC again.
3. Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0461 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0462: Fuel Level Sensor Circuit Low Input

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

A short circuit is detected while monitoring the fuel level sensor output.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

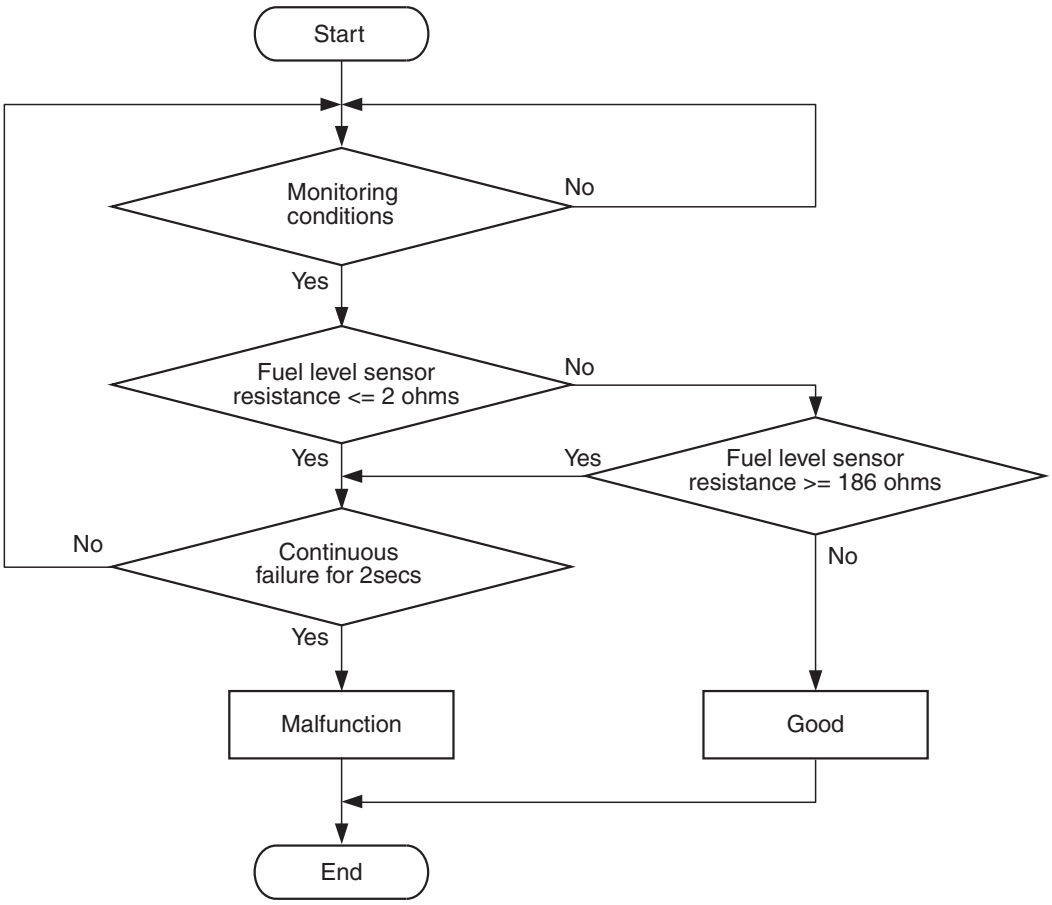
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604342

Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine staring sequence was completed.

Judgement Criterion

- Fuel level sensor resistance has continued to be lower than 2 ohms for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

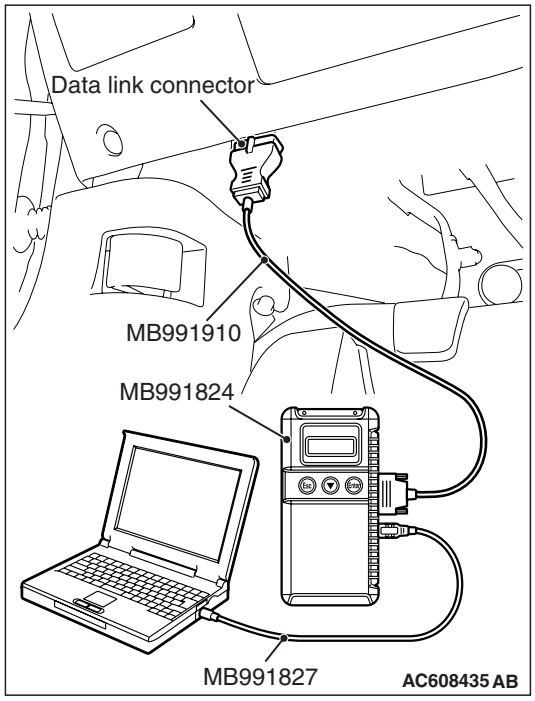
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel level sensor failed.
- Combination meters assembly failed.
- Connector damage
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the combination meter diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter DTC set?

YES : Refer to GROUP 54A, Chassis Electrical – Combination Meter –Diagnosis Trouble Code Chart P.54A-23

NO : Go to Step 2.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0462 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0462 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

TSB Revision

DTC P0463: Fuel Level Sensor Circuit High Input

TECHNICAL DESCRIPTION

- The fuel level sensor converts the rest of the fuel to a voltage and sends it to the combination meter.
- The combination meter sends the data regarding the rest of the fuel to the ECM.
- The ECM checks whether this data is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

An open circuit is detected while monitoring the fuel level sensor output.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

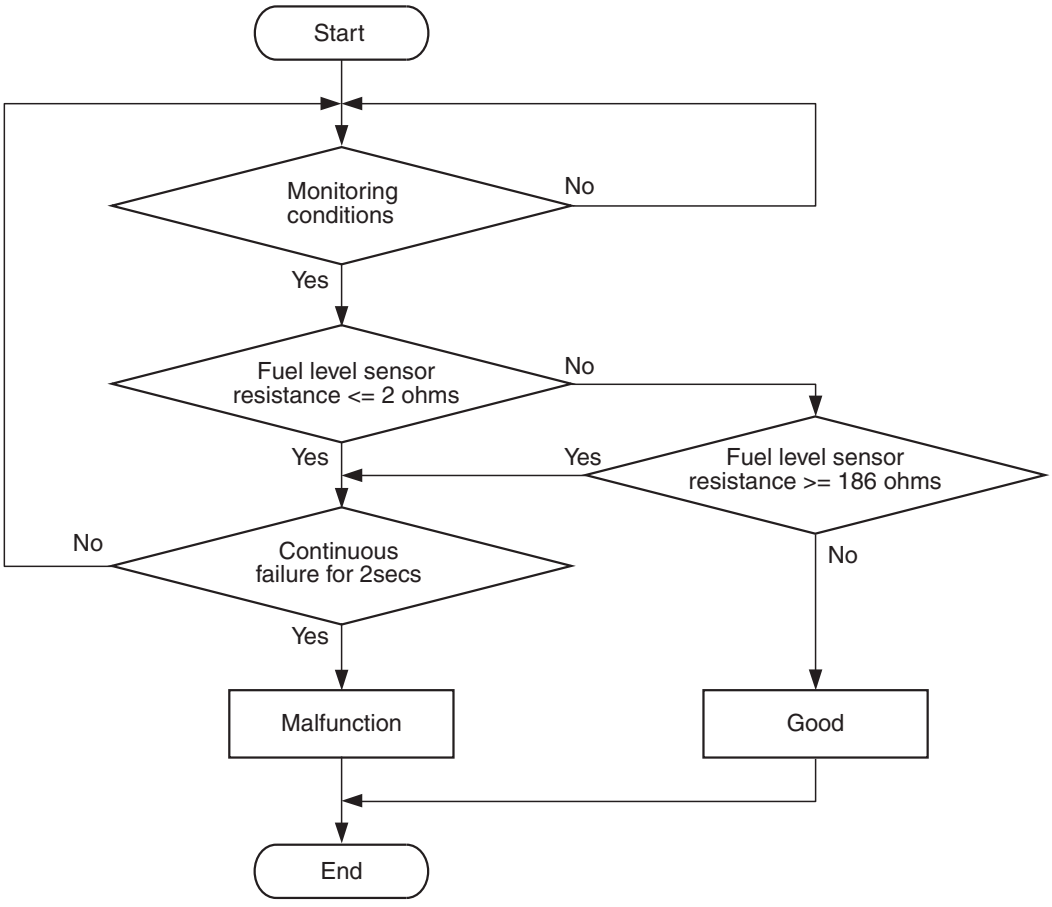
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604342

Check Conditions

- Battery positive voltage is between 11 and 16.5 volts.
- 2 seconds or more have passed since the engine staring sequence was completed.

TSB Revision

Judgement Criterion

- Fuel level sensor resistance has continued to be higher than 186 ohms for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

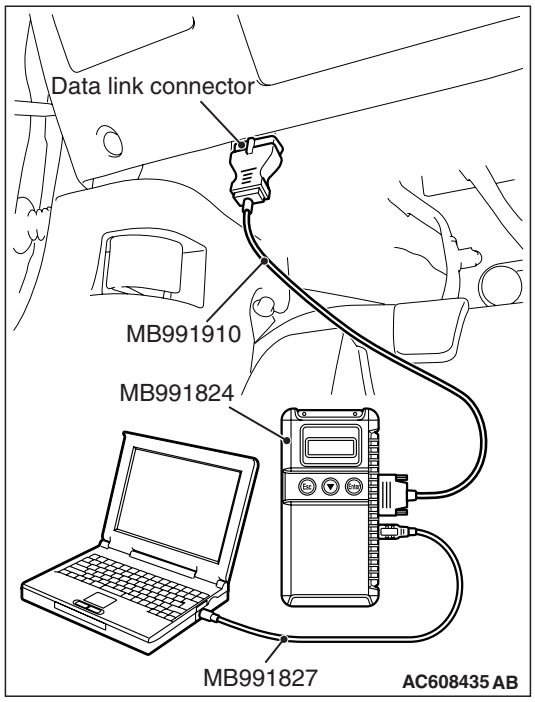
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Fuel level sensor failed.
- Combination meters assembly failed.
- Connector damage
- Harness damage
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the combination meter diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the combination meter DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter DTC set?

YES : Refer to GROUP 54A, Chassis Electrical – Combination Meter –Diagnosis Trouble Code Chart P.54A-23

NO : Go to Step 2.

STEP 2. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0463 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Code Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

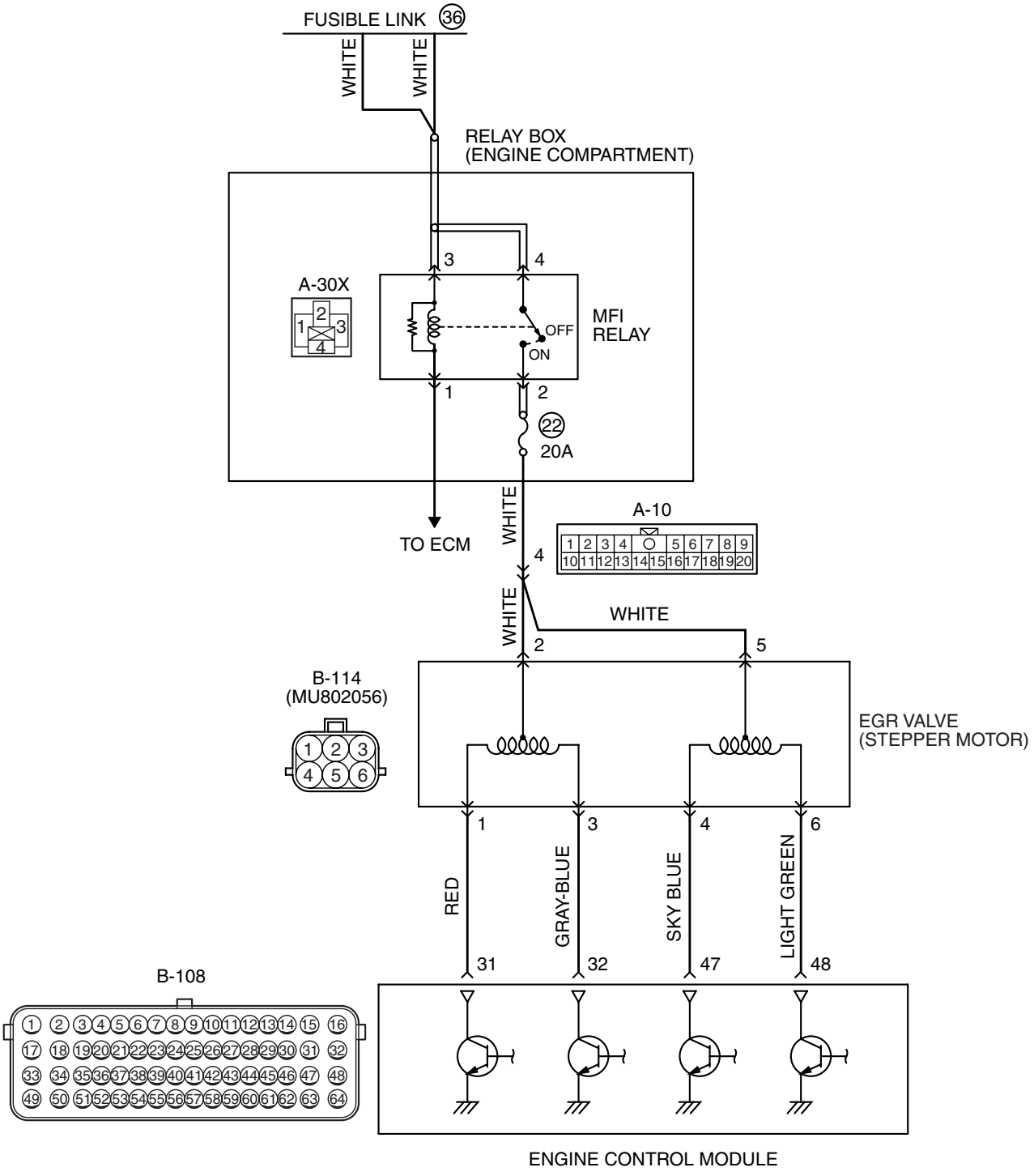
Q: Is DTC P0463 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0489: EGR Valve (stepper motor) Circuit Malfunction (ground short) <California>

EGR VALVE (STEPPER MOTOR) CIRCUIT <CALIFORNIA>



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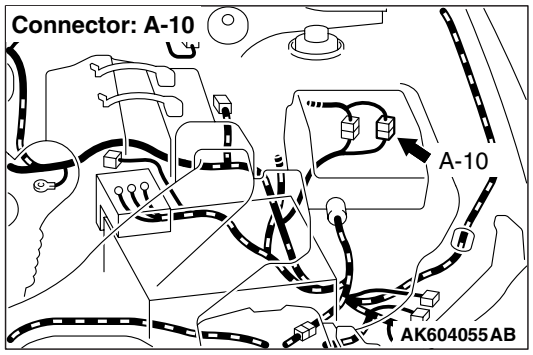
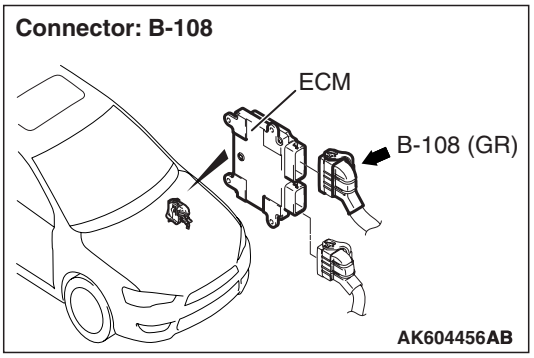
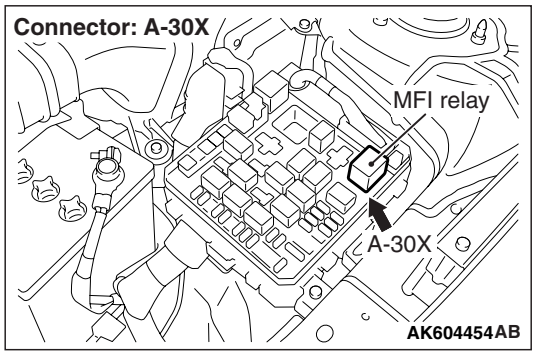
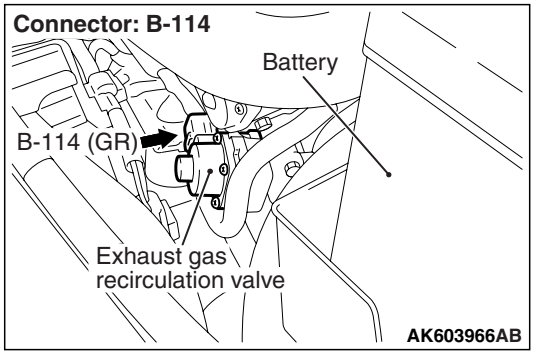








CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 2).
- The ECM (terminals No. 31, No. 32, No. 47, No. 48) drives the stepper motor by sequentially turning "ON" the power transistors in the ECM and providing ground to the EGR valve (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

The ECM checks wether a short circuit to the ground or an open circuit exists or not by measuring the EGR valve (stepper motor) drive circuit voltage when the current is not flowing through the coil of the EGR valve (stepper motor).

DESCRIPTIONS OF MONITOR METHODS

When the EGR valve (stepper motor) drive circuit voltage is under the specified range, it is judged that a malfunction exists.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

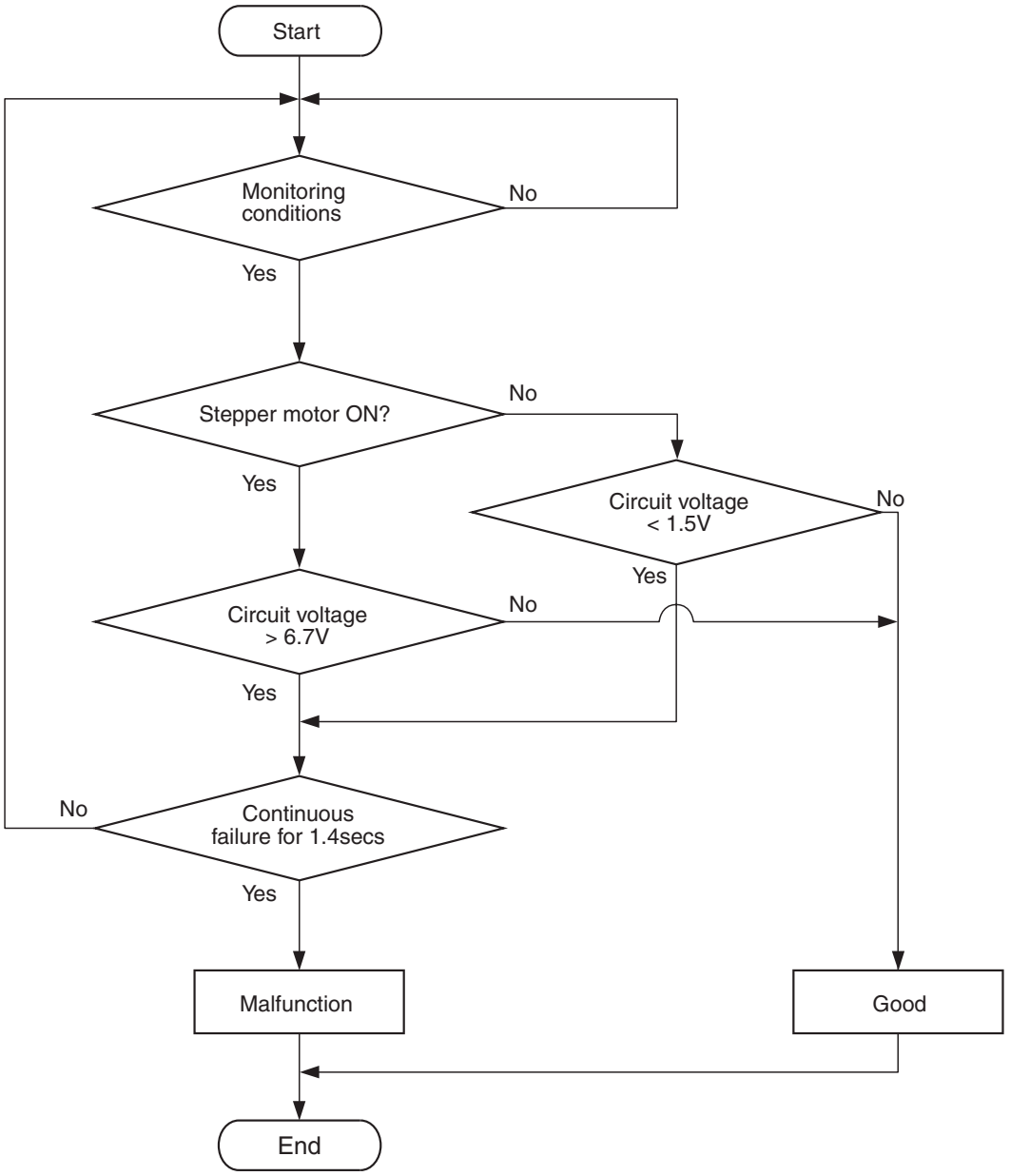
- Exhaust gas recirculation (EGR) stepper motor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Ignition switch is "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- When EGR valve is de-energized, the EGR voltage should be 1.5 volts or less for 1.4 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve (stepper motor) failed.
- Open or shorted EGR valve (stepper motor) circuit, harness damage or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness Set
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector B-114 at EGR valve for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 2. Measure the EGR valve motor coil resistance.

(1) Disconnect the EGR valve connector B-114.

(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

Standard value: 20 –24 ohms [at 20°C (68°F)]

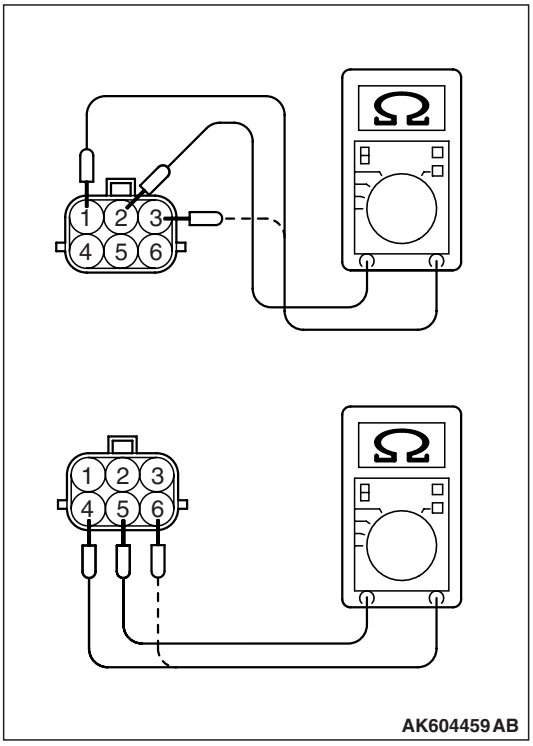
(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 4 or terminal No. 6

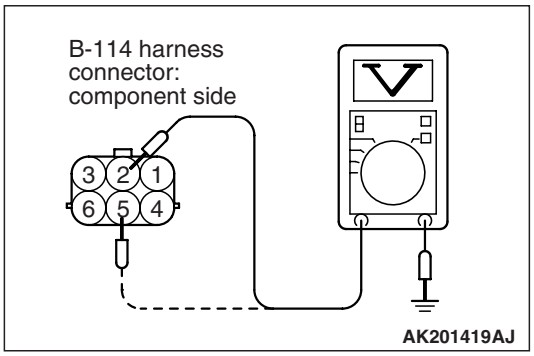
Standard value: 20 –24 ohms [at 20°C (68°F)]

Q: Is the measured resistance between 20 and 24 ohms [at 20°C (68°F)]?

YES : Go to Step 3.

NO : Replace the EGR valve. Then go to Step 11.





STEP 3. Measure the power supply voltage at EGR valve harness side connector B-114.

(1) Disconnect the connector B-114 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2, No. 5 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and EGR valve connector B-114 (terminal No. 2, No. 5) because of open circuit or short circuit to ground. Then go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

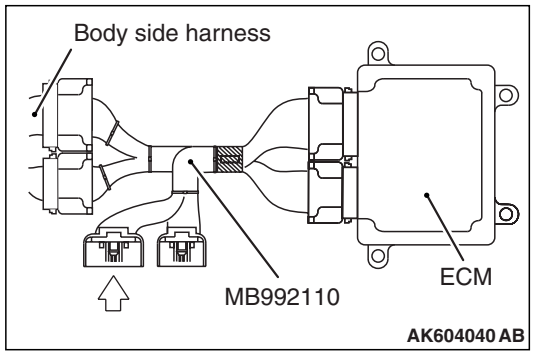
STEP 5. Check harness connector B-108 at ECM for damage.

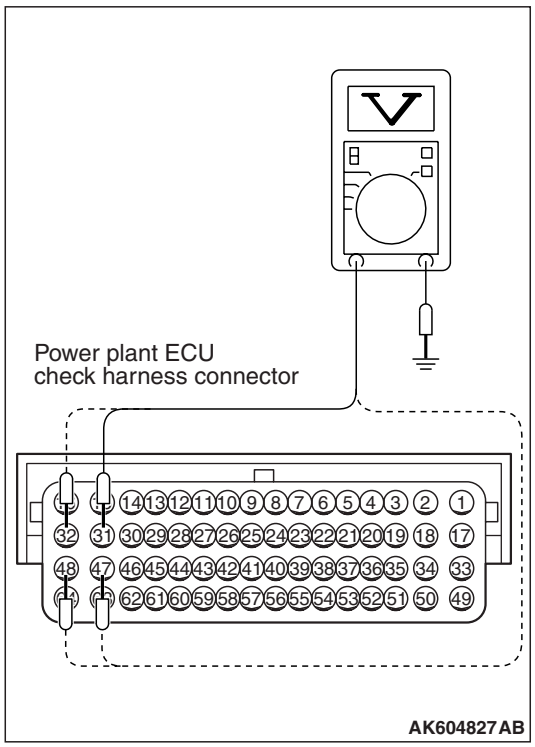
Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 6. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.





(2) Measure the voltage between terminal (No. 31, No. 32, No. 47, No. 48) and ground.
- The voltage should be between 5 and 8 volts for approximately 3 seconds when the Ignition switch is turned from the "LOCK" (OFF) position to the "ON" position.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage normal?

YES : Go to Step 8.
NO : Go to Step 7.

STEP 7. Check for open circuit and short circuit to ground between EGR valve connector B-114 and ECM connector B-108.

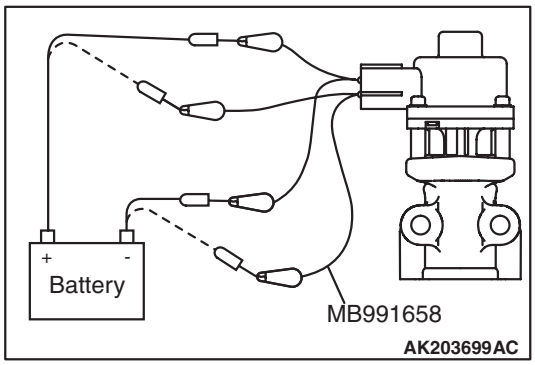
a. EGR valve connector B-114 (terminal No. 1) and ECM connector B-108 (terminal No. 31).
b. EGR valve connector B-114 (terminal No. 3) and ECM connector B-108 (terminal No. 32).
c. EGR valve connector B-114 (terminal No. 4) and ECM connector B-108 (terminal No. 47).
d. EGR valve connector B-114 (terminal No. 6) and ECM connector B-108 (terminal No. 48).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

NO : Repair it. Then go to Step 11.

STEP 8. Check the EGR valve operation using special tool MB991658.



(1) Remove the EGR valve.
(2) Connect special tool MB991658 to the EGR valve. (All terminals should be connected.)
(3) Use the jumper wires to connect terminal No. 2 of the EGR valve connector to the positive battery terminal.
(4) Check to ensure that the motor operates when the terminal No. 1 and No. 3 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(5) Then, use jumper wires to connect the terminal No. 5 of the EGR valve connector to the positive battery terminal.
(6) Check to ensure that the motor operates when terminal No. 4 and No. 6 of the EGR valve connector are respectively connected to the negative battery terminal using a jumper wire.
- Vibration should be present at each application of voltage to test clip combination.

(7) Reinstall the EGR valve, using a new gasket, and tighten to the specified torque.

Tighten torque: 24 ±3 N· m [17 ±3 ft· lb]

Q: Is the EGR valve operating properly?

YES : Go to Step 9.

NO : Replace the EGR valve. Then go to Step 11.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and EGR valve connector B-114 (terminal No. 2, No. 5).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 11.

STEP 10. Check for harness damage between EGR valve connector B-114 and ECM connector B-108.

a. EGR valve connector B-114 (terminal No. 1) and ECM connector B-108 (terminal No. 31).
b. EGR valve connector B-114 (terminal No. 3) and ECM connector B-108 (terminal No. 32).
c. EGR valve connector B-114 (terminal No. 4) and ECM connector B-108 (terminal No. 47).
d. EGR valve connector B-114 (terminal No. 6) and ECM connector B-108 (terminal No. 48).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : Repair it. Then go to Step 11.

STEP 11. Test the OBD-II drive cycle.

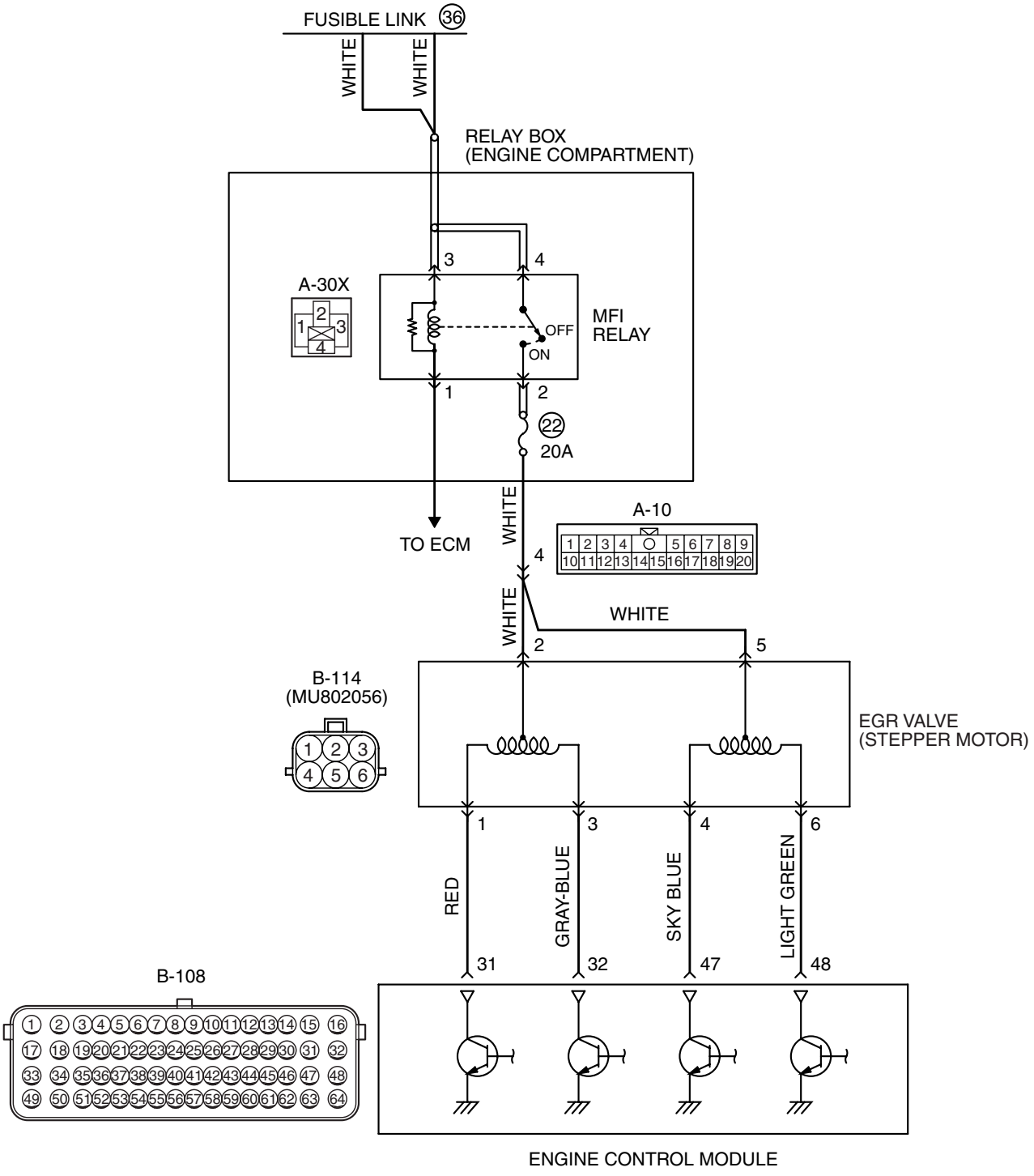
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 3 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0489 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0490: EGR Valve (stepper motor) Circuit Malfunction (battery short) <California>

EGR VALVE (STEPPER MOTOR) CIRCUIT <CALIFORNIA>



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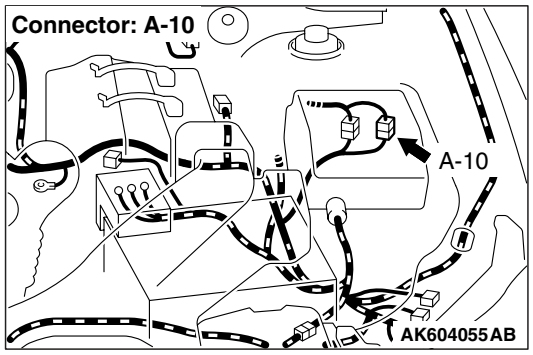
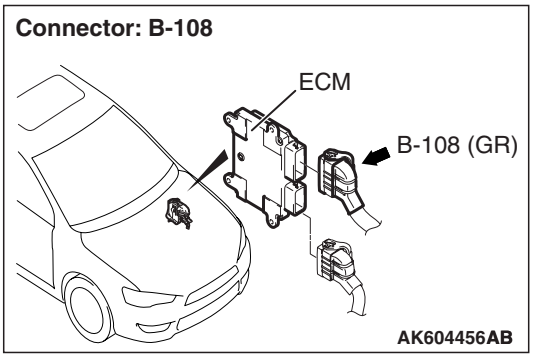
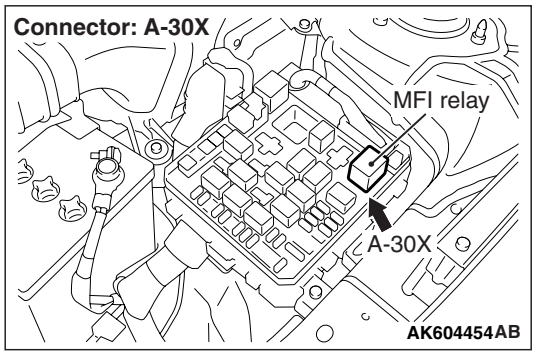
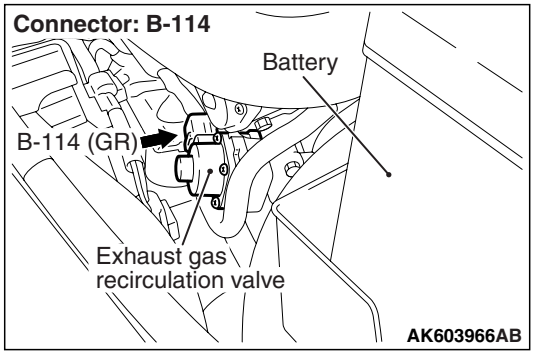








CIRCUIT OPERATION

- The EGR valve power is supplied from the MFI relay (terminal No. 2).
- The ECM (terminals No. 31, No. 32, No. 47, No. 48) drives the stepper motor by sequentially turning "ON" the power transistors in the ECM and providing ground to the EGR valve (terminal No. 1, No. 3, No. 4, No. 6).

TECHNICAL DESCRIPTION

The ECM checks wether a short circuit to the power supply exists or not by measuring the EGR valve (stepper motor) drive circuit voltage when the current is not flowing through the coil of the EGR valve (stepper motor).

DESCRIPTIONS OF MONITOR METHODS

When the EGR valve (stepper motor) drive circuit voltage is over the specified range, it is judged that a malfunction exists.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

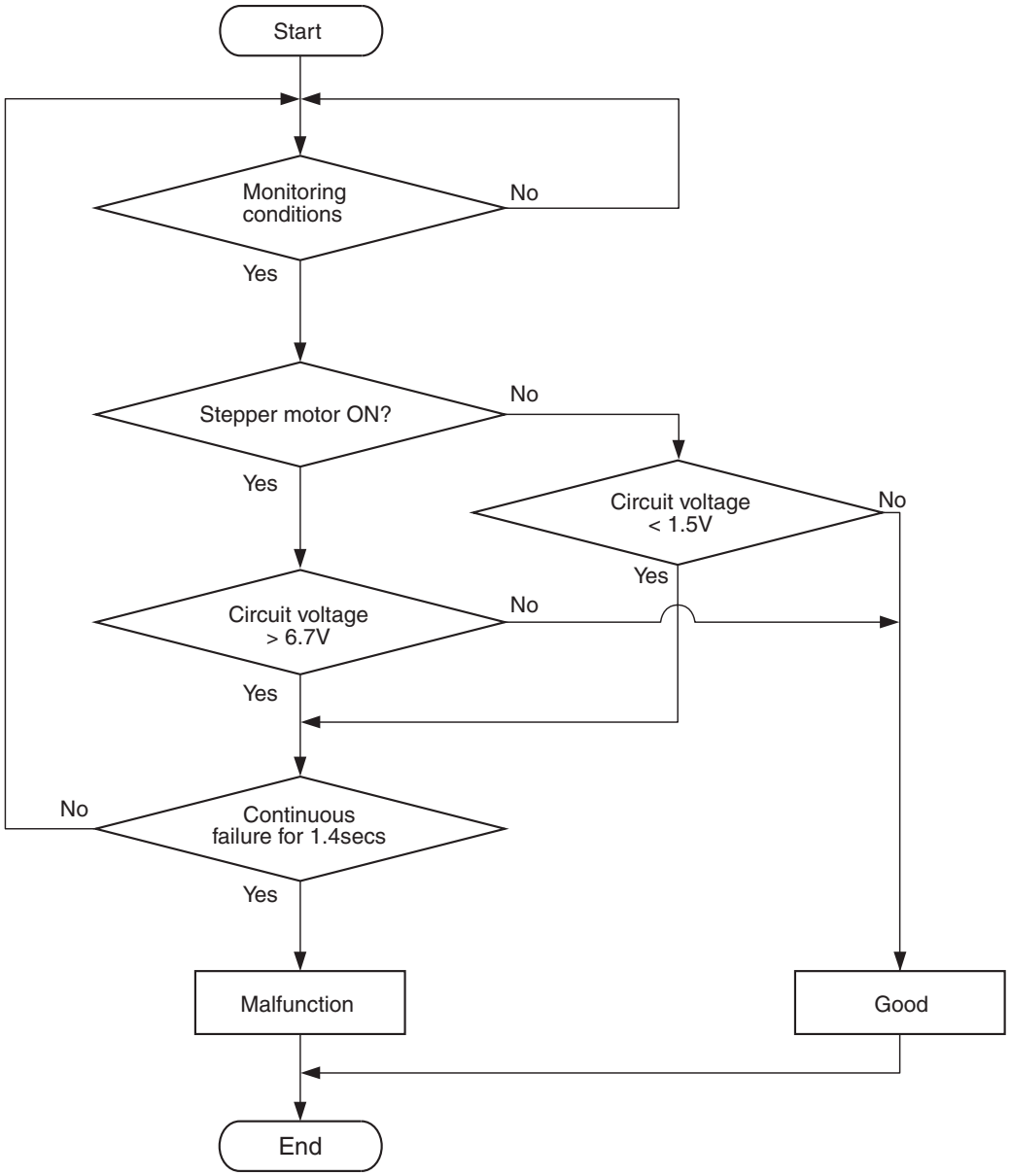
- Exhaust gas recirculation (EGR) stepper motor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Accelerator pedal position sensor
- Manifold absolute pressure sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Ignition switch is "ON" position.
- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- When EGR valve is energized, the ECM voltage should be 6.7 volts or more for 1.4 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 3 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- EGR valve (stepper motor) failed.
- Shorted EGR valve (stepper motor) circuit, harness damage or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-114 at EGR valve for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 2. Measure the EGR valve motor coil resistance.

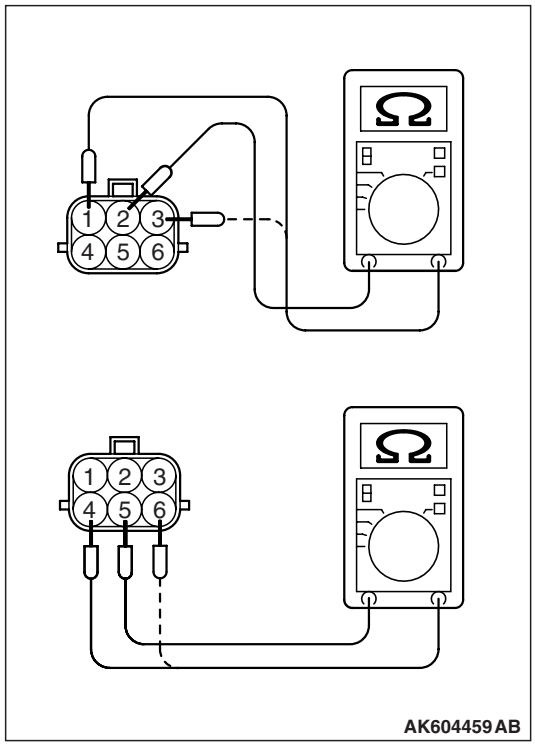
(1) Disconnect the EGR valve connector B-114.

(2) Measure the resistance between EGR valve connector terminal No. 2 and either terminal No. 1 or terminal No. 3.

Standard value: 20 –24 ohms [at 20° C (68° F)]

(3) Measure the resistance between EGR valve connector terminal No. 5 and either terminal No. 4 or terminal No. 6

Standard value: 20 –24 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 20 and 24 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the EGR valve. Then go to Step 5.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 4. Check for short circuit to power supply between EGR valve connector B-114 and ECM connector B-108.

a. EGR valve connector B-114 (terminal No. 1) and ECM connector B-108 (terminal No. 31).
b. EGR valve connector B-114 (terminal No. 3) and ECM connector B-108 (terminal No. 32).
c. EGR valve connector B-114 (terminal No. 4) and ECM connector B-108 (terminal No. 47).
d. EGR valve connector B-114 (terminal No. 6) and ECM connector B-108 (terminal No. 48).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO : Repair it. Then go to Step 5.

STEP 5. Test the OBD-II drive cycle.

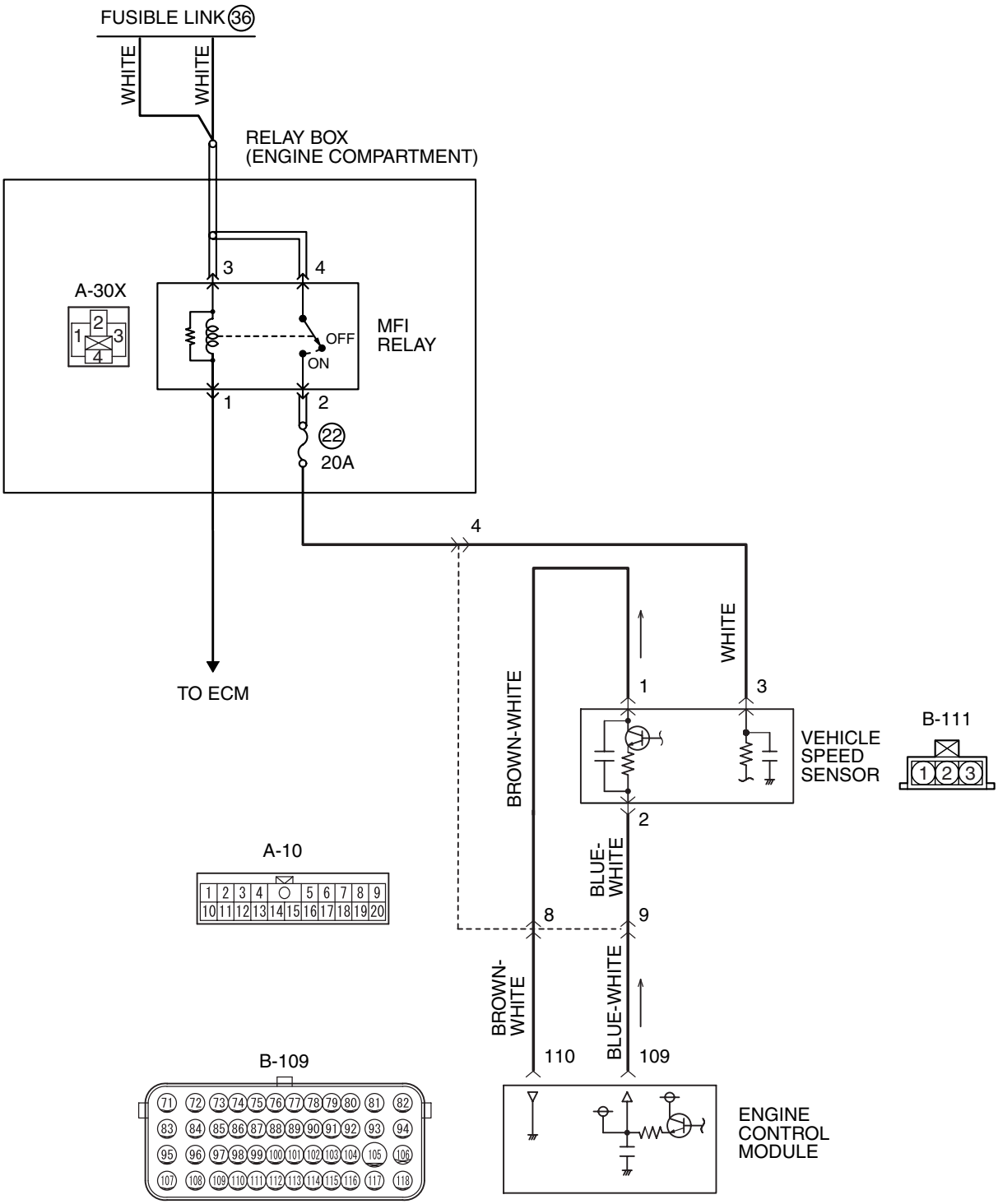
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 3 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0490 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0500: Vehicle Speed Sensor Malfunction <M/T>

VEHICLE SPEED SENSOR CIRCUIT <M/T>



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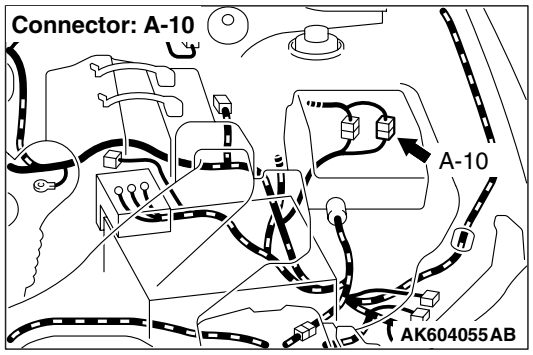
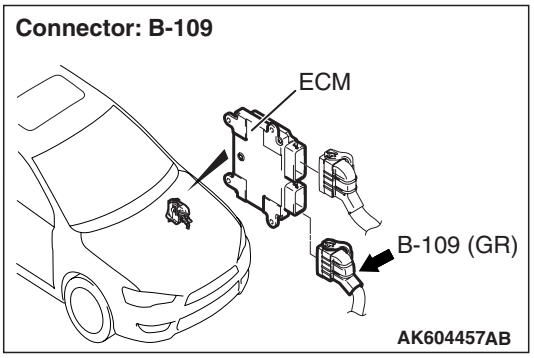
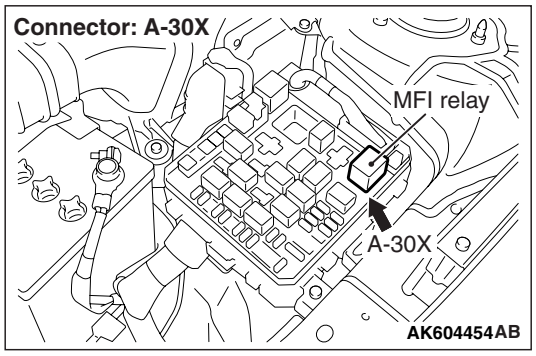
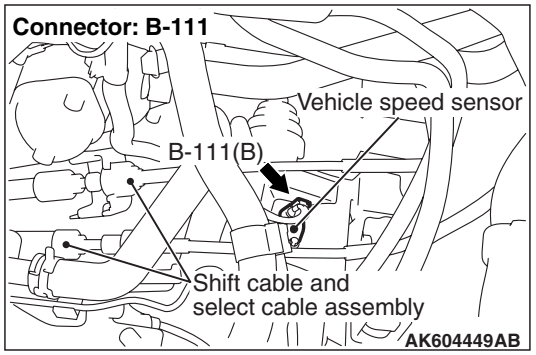








CIRCUIT OPERATION

- A 5-volt voltage is applied to the vehicle speed sensor output terminal (terminal No. 2) from the ECM (terminal No. 109). The vehicle speed sensor generates a pulse signal when the output terminal is opened and grounded.

TECHNICAL DESCRIPTION

- The vehicle speed sensor converts the vehicle speed into pulse signals and inputs them to the ECM.
- The vehicle speed sensor outputs a pulse signal while the vehicle is driven.
- The ECM checks whether the pulse signal is output.

DESCRIPTIONS OF MONITOR METHODS

- If the vehicle speed sensor output does not change while the vehicle is being driven in the medium- to high-speed range, a malfunction is determined to have occurred.

MONITOR EXECUTION

- Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

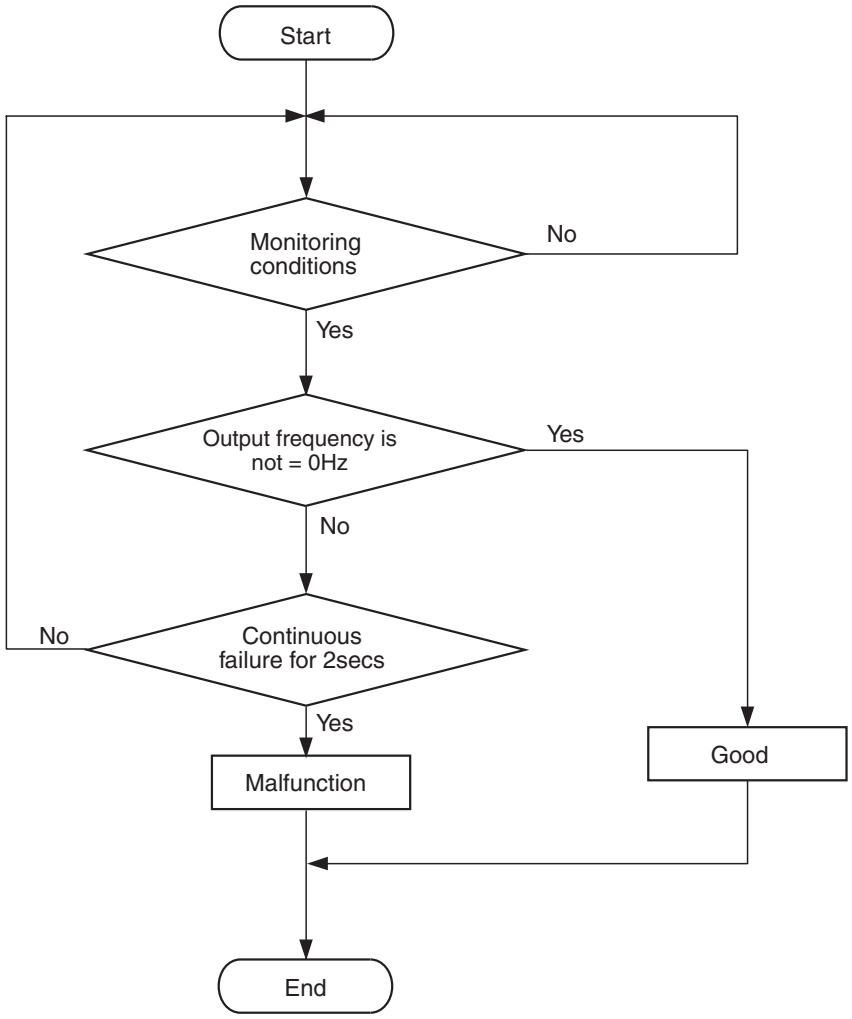
- Not applicable

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor

DTC SET CONDITIONS (Entry Conditions and Malfunction Thresholds)

Logic Flow Chart



Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Engine speed is between 2,000 and 4,000 r/min.
- Volumetric efficiency is between 40 and 65 percent.

Judgement Criterion

- Vehicle speed sensor output voltage has not changed (no pulse signal is input) for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

None

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Vehicle speed sensor failed.
- Open or shorted vehicle speed sensor circuit, or harness damage, or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

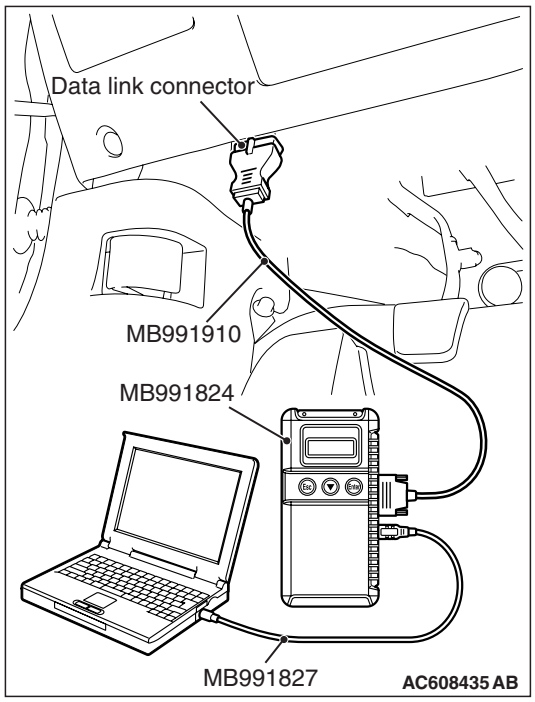
STEP 1. Using scan tool MB991958, check data list item 4: Vehicle Speed Sensor.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine.
(3) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
  - Check that the speedometer and M.U.T.-III display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(4) Turn the ignition switch to the "LOCK" (OFF) position.



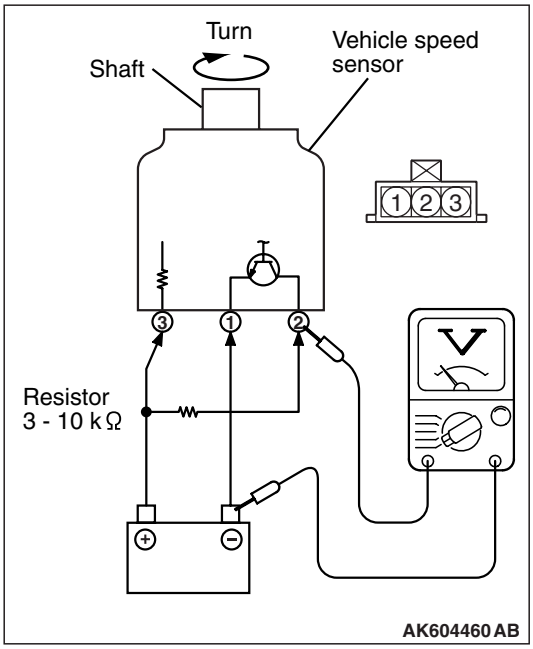
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check connector B-111 at vehicle speed sensor for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.



STEP 3. Check the vehicle speed sensor.

1.Remove the vehicle speed sensor and connect a 3 –10 kΩ resistor as shown in the illustration.

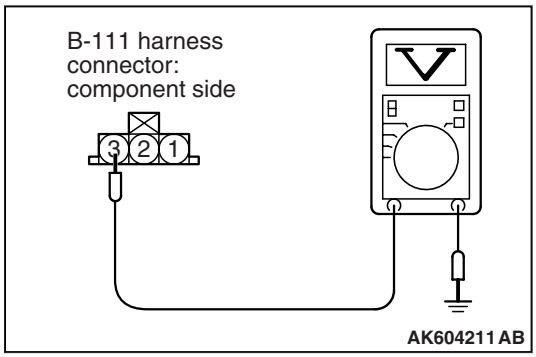
2.Turn the shaft of the vehicle speed sensor and check that there is voltage between terminals 2 –3. (1 turn = 4 pulses)

Standard value: 0 or Battery Voltage (1 turn = 4pulses)

Q: Is the vehicle speed sensor normal?

YES : Go to Step 4.

NO : Replace the vehicle speed sensor. Then go to Step 17.



STEP 4. Measure the power supply voltage at vehicle speed sensor connector B-111.

(1) Disconnect the connector B-111 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 3 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Go to Step 5.

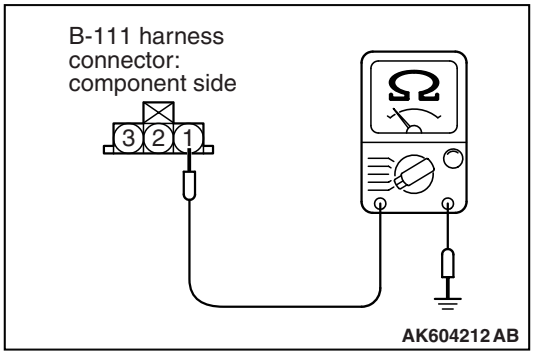
STEP 5. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and vehicle speed sensor connector B-111 (terminal No. 3) because of open circuit or short circuit to ground. Then go to Step 17.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

TSB Revision



STEP 6. Check the continuity at vehicle speed sensor harness side connector B-111.

(1) Disconnect the connector B-111 and measure at the harness side.
(2) Check for the continuity between terminal No. 1 and ground.
- Continuity (2 ohms or less)

Q: Does the continuity exist?

YES : Go to Step 10.
NO : Go to Step 7.

STEP 7. Check connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

STEP 8. Check for open circuit and harness damage between vehicle speed sensor connector B-111 (terminal No. 1) and ECM connector B-109 (terminal No. 110).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 17.

STEP 9. Using scan tool MB991958, check data list item 4: Vehicle Speed Sensor.

(1) Start the engine.
(2) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and M.U.T.-III display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 17.

STEP 10. Measure the sensor supply voltage at vehicle speed sensor harness side connector B-111.

(1) Disconnect the vehicle speed sensor connector B-111 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 14.
NO : Go to Step 11.

STEP 11. Check connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

STEP 12. Check for open circuit and short circuit to ground between vehicle speed sensor connector B-111 (terminal No. 2) and ECM connector B-109 (terminal No. 109).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 17.

TSB Revision

STEP 13. Using scan tool MB991958, check data list item 4: Vehicle Speed Sensor.

(1) Start the engine.
(2) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and M.U.T.-III display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 17.

STEP 14. Check connectors B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 15.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

STEP 15. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and vehicle speed sensor connector B-109 (terminal No. 3).

NOTE: Check harness connector after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 16.

NO : Repair it. Then go to Step 17.

STEP 16. Check for harness damage between vehicle speed sensor connector B-111 (terminal No. 2) and ECM connector B-109 (terminal No. 109).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 17.

Q: Is the harness wire in good condition?

YES : Go to Step 17.

NO : Repair it. Then go to Step 17.

STEP 17. Using scan tool MB991958, check data list item 4: Vehicle Speed Sensor.

(1) Start the engine.
(2) Set scan tool MB991958 to the data reading mode for item 4, Vehicle Speed Sensor.
- Check that the speedometer and M.U.T.-III display speed match when traveling at a vehicle speed of 40 km/h (25 mph).

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0506: Idle Control Sytem RPM Lower Than Expected

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

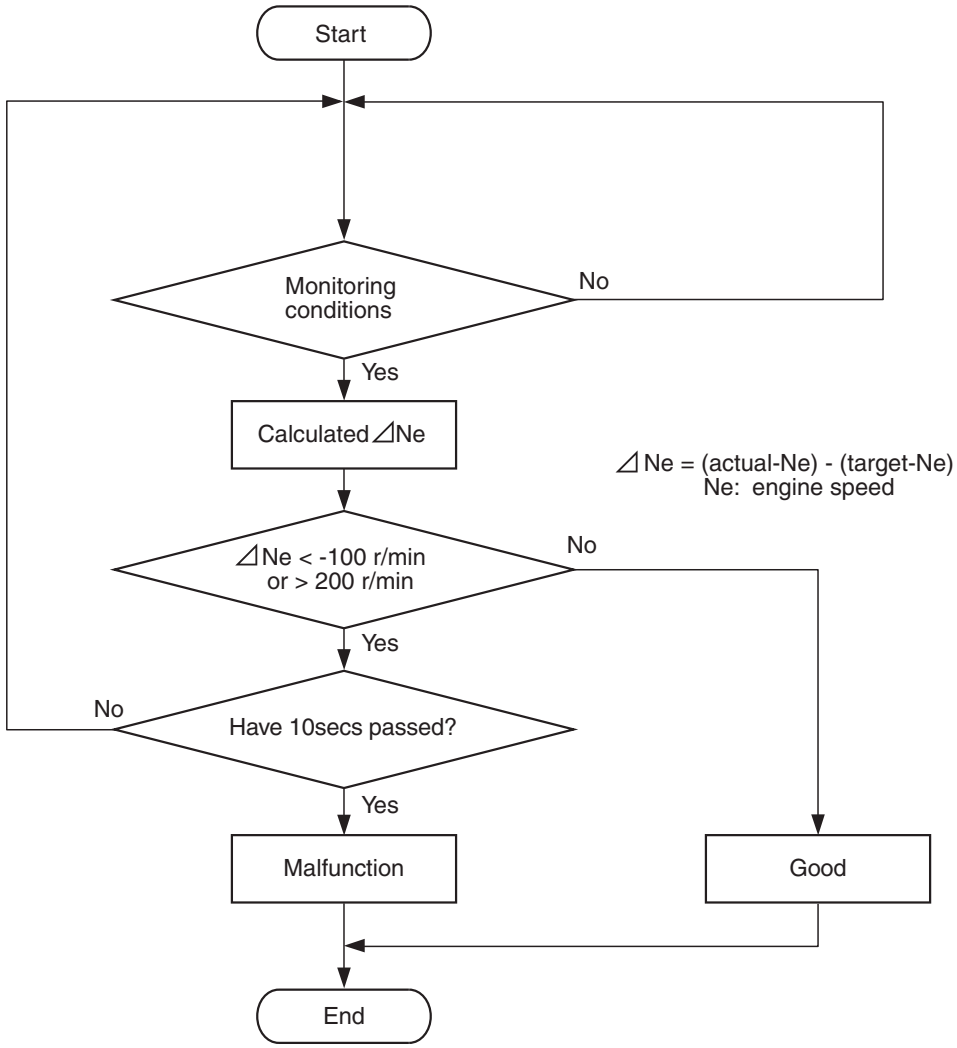
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor <California>
- Fuel system monitor
- Vehicle speed sensor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604345

Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is more than 41° C (105° F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: OFF
- Volumetric efficiency is lower than 40 percent.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target airflow rate is more than 12 L/sec when engine coolant temperature is higher than 77° C (171° F).
- Target airflow rate is more than 23 L/sec when engine coolant temperature is lower than 77° C (171° F).

Judgement Criterion

- The actual idle speed is more than 100 r/min lower than the target idle speed for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 18 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle valve area is dirty.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

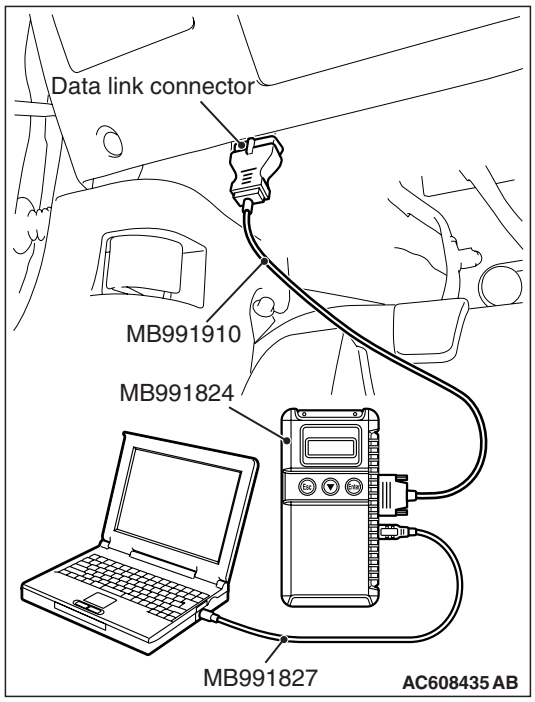
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0506 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle body cleaning P.13A-929. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0506 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : The inspection is complete.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0506 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0507: Idle Control Sytem RPM Higher Than Expected

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

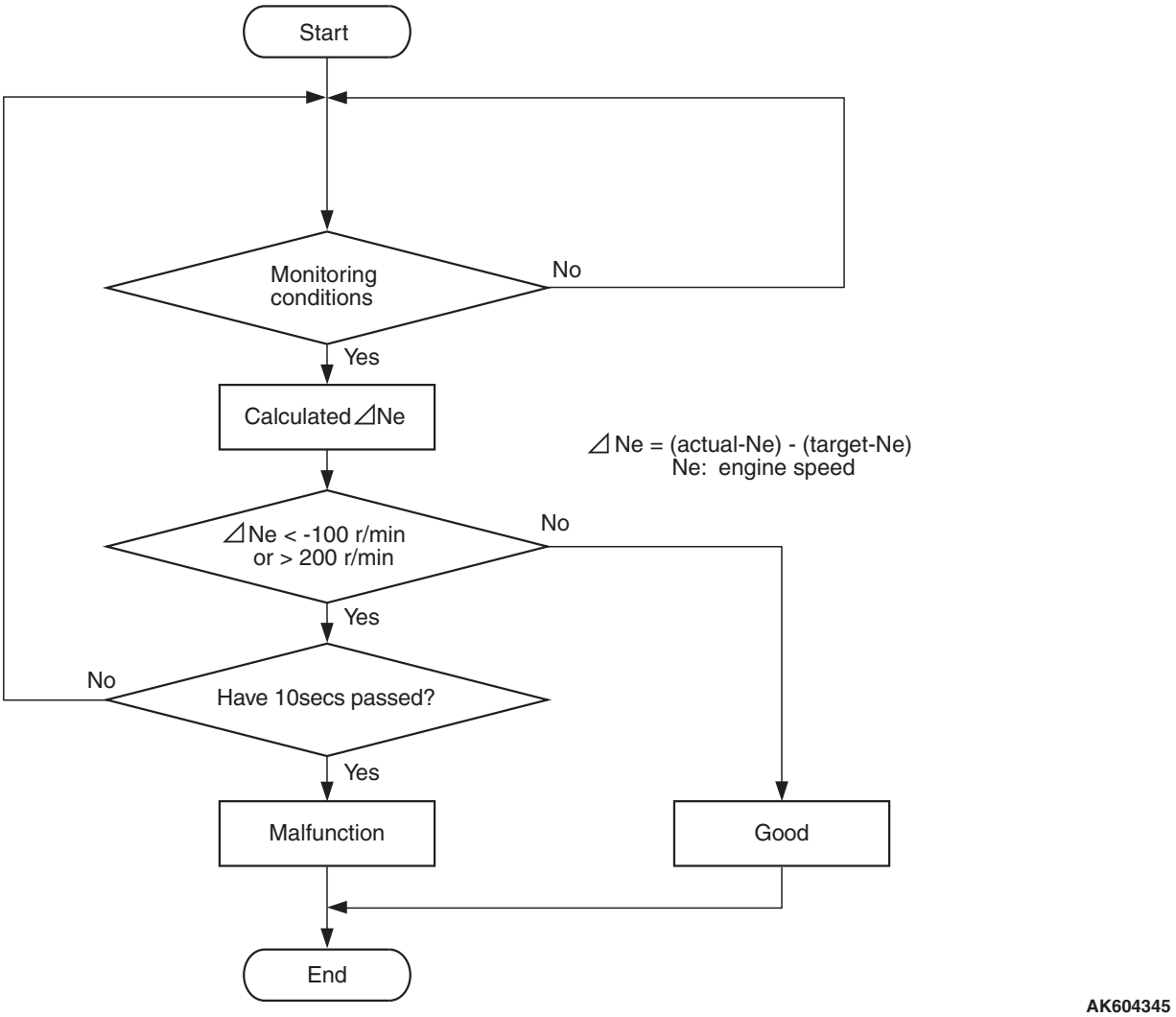
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor <California>
- Fuel system monitor
- Vehicle speed sensor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604345

Check Conditions

- Vehicle speed has reached 1.5 km/h (1.0 mph) or more at least once.
- Under the closed loop idle speed control.
- Engine coolant temperature is higher than 41° C (105° F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- 3 seconds have elapsed from the start of the previous monitoring.
- Target airflow rate is 0 L/sec.

Judgement Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 10 seconds.
  *: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45° C (113° F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 18 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake system vacuum leak.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

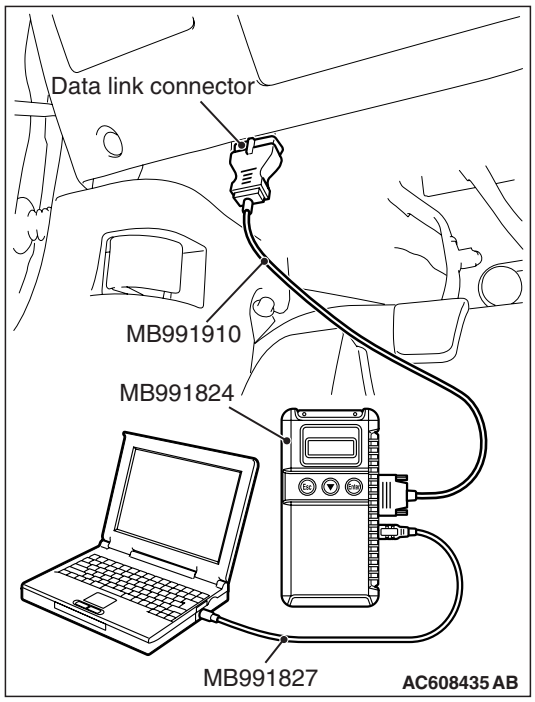
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958, read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P0507 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P0507 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : The inspection is complete.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0507 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P0513: Immobilizer Malfunction

TECHNICAL DESCRIPTION

- ECM monitors the communication condition with the immobilizer-ECU. When an abnormality in communication is found, ECM prevents engine start.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- When it was different in the encrypted code sent from immobilizer-ECU and operation result by ECM.

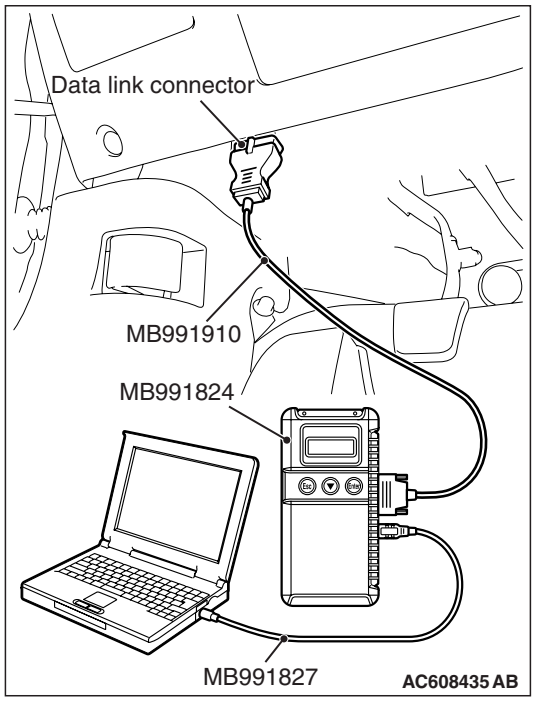
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN system failed.
- Immobilizer system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check VIN Information.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Set scan tool MB991958 to the coding mode for VIN Information.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Has VIN (current) been written?

YES : Go to Step 2.
NO : Write VIN. Then go to Step 2.

STEP 2. Using scan tool MB991958, read the immobilizer diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the immobilizer-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer-DTC set?

YES : Refer to GROUP 42B, Diagnosis –Diagnostic Trouble Code Chart <Vehicles with KOS> P.42B-20 or GROUP 42C, diagnosis –Diagnostic Trouble Code Chart <Vehicles with WCM> P.42C-14.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC)

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

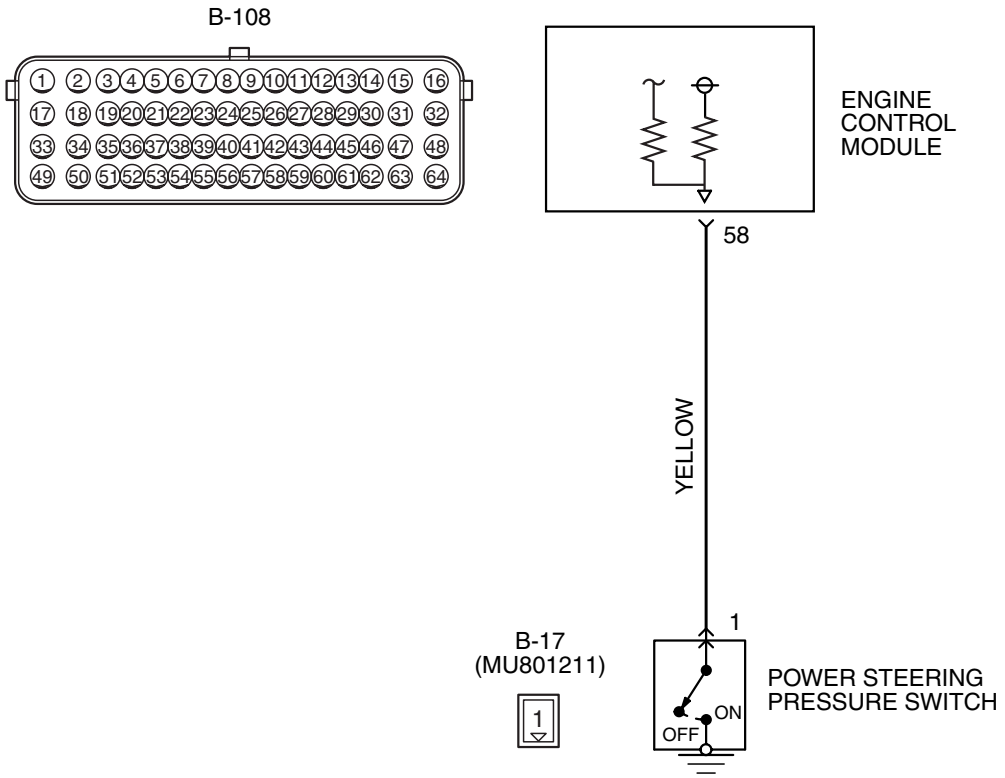
Q: Is DTC P0606 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

TSB Revision

DTC P0551: Power Steering Pressure Switch Circuit Range/Performance

POWER STEERING PRESSURE SWITCH CIRCUIT



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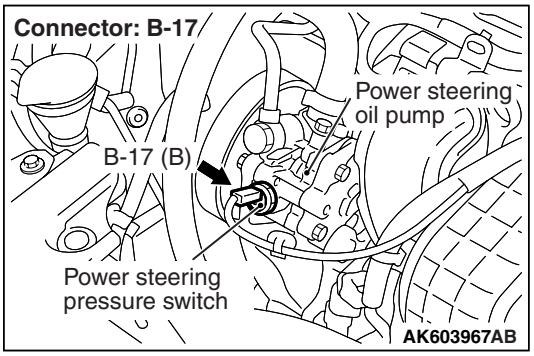
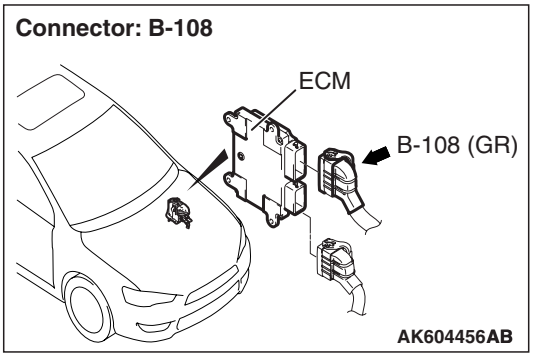




CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM (terminal No. 58) via the resistor in the ECM.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM.

TSB Revision

- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch stays on during specified go/stop operations.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

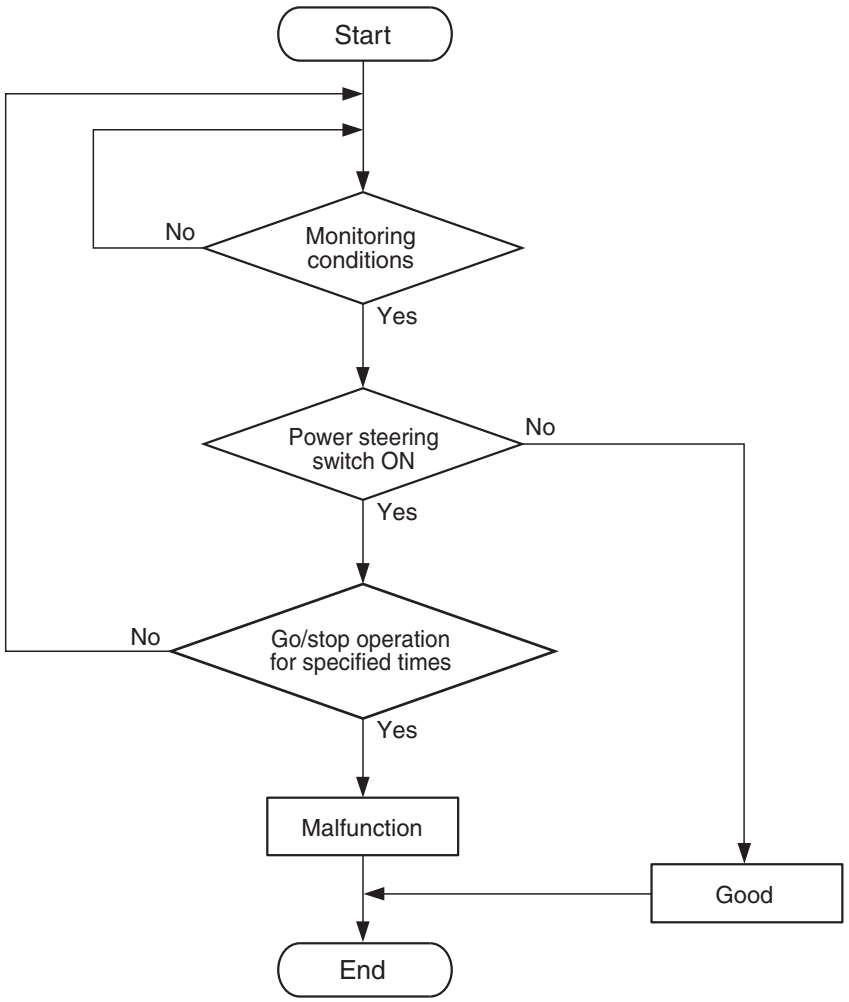
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604346

TSB Revision

Check Conditions

- Engine coolant temperature is higher than 20° C (68° F).
- Drive for 4 seconds or more with the vehicle speed is 50 km/h (31 mph) or more. Stop the vehicle [vehicle speed is 1.5 km/h (1.0 mph) or less]. Repeat 10 times or more.

Judgement Criterion

- Power steering pressure switch continues to be "ON".

OBD-II DRIVE CYCLE PATTERN

None.

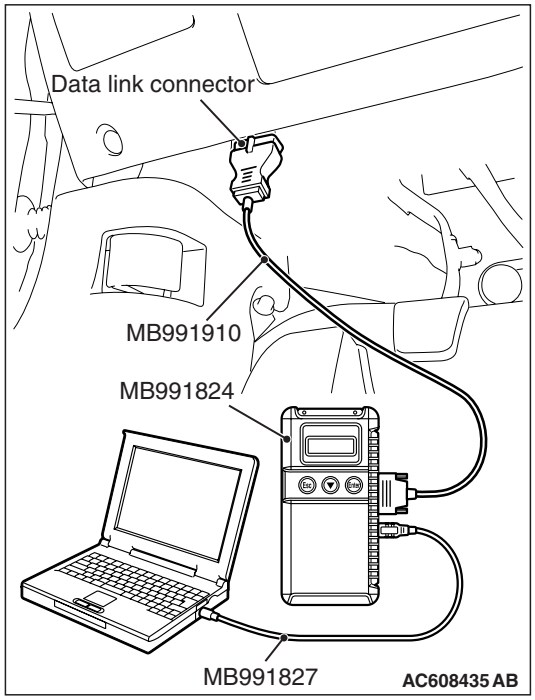
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Open or shorted power steering pressure switch circuit, harness damage, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

⚠ CAUTION

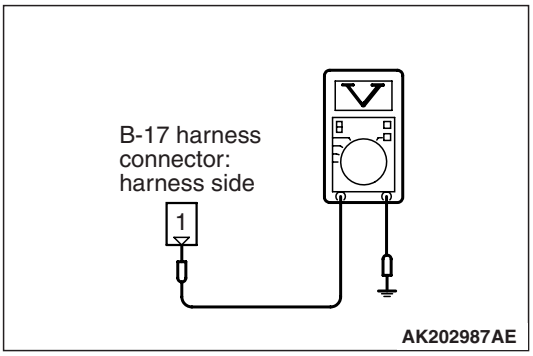
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
  - If the steering wheel is not turned while idling, "OFF" will be displayed.
  - If the steering wheel is turned while idling, "ON" will be displayed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Go to Step 2.



STEP 2. Measure the power supply voltage at power steering pressure switch connector B-17 by backprobing.

(1) Do not disconnect the connector B-17.
(2) Start the engine and run at idle.
(3) Measure the voltage between terminal No. 1 and ground by backprobing.
- When steering wheel is not turned, voltage should be battery positive voltage.
- When steering wheel is turned, voltage should be 1 volt or less.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage within the specified range?

YES : Go to Step 3.
NO : Go to Step 5.

STEP 3. Check harness connector B-17 at power steering pressure switch for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 4. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 13.

STEP 5. Check harness connector B-17 at power steering pressure switch for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

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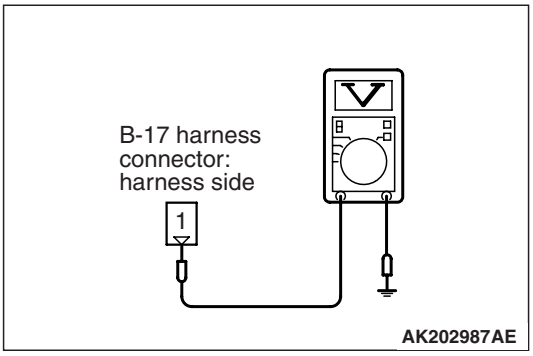


STEP 6. Measure the power supply voltage at power steering pressure switch harness side connector B-17.

(1) Disconnect the connector B-17 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

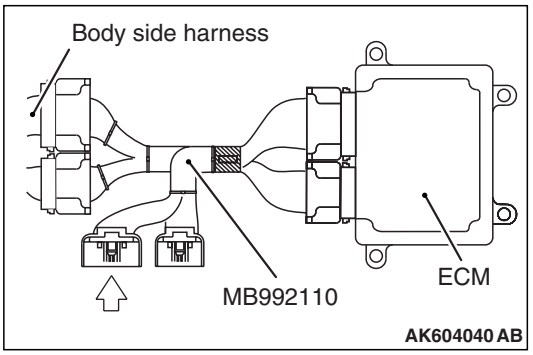
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 7.

STEP 7. Check harness connector B-108 at ECM for damage.

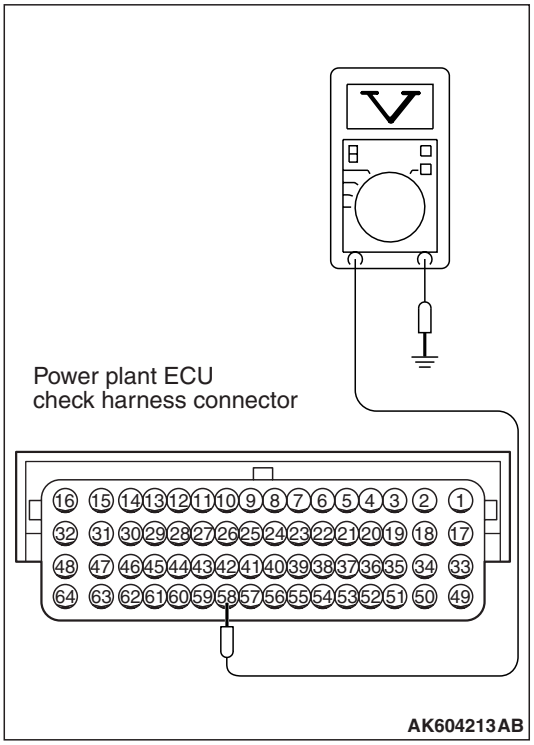
Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.



STEP 8. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.

(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Disconnect the power steering pressure switch connector B-17.
(3) Turn the ignition switch to the "ON" position.



(4) Measure the voltage between terminal No. 58 and ground.
- Voltage should be between battery positive voltage.

(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Repair harness wire between power steering pressure switch connector B-17 (terminal No. 1) and ECM connector B-108 (terminal No. 58) because of open circuit. Then go to Step 13.

NO : Go to Step 9.

STEP 9. Check for short circuit to ground between power steering pressure switch connector B-17 (terminal No. 1) and ECM connector B-108 (terminal No. 58).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 13.

NO : Repair it. Then go to Step 13.

STEP 10. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 13.

STEP 11. Check for harness damage between power steering pressure switch connector B-17 (terminal No. 1) and ECM connector B-108 (terminal No. 58).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 13.

STEP 12. Replace the power steering pressure switch.

(1) Replace the power steering pressure switch.
(2) Check the trouble symptoms.
(3) Read in the diagnostic trouble code (DTC).

Q: Is DTC P0551 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 13.
NO : Go to Step 13.

STEP 13. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
- If the steering wheel is not turned while idling, "OFF" will be displayed.
- If the steering wheel is turned while idling, "ON" will be displayed.

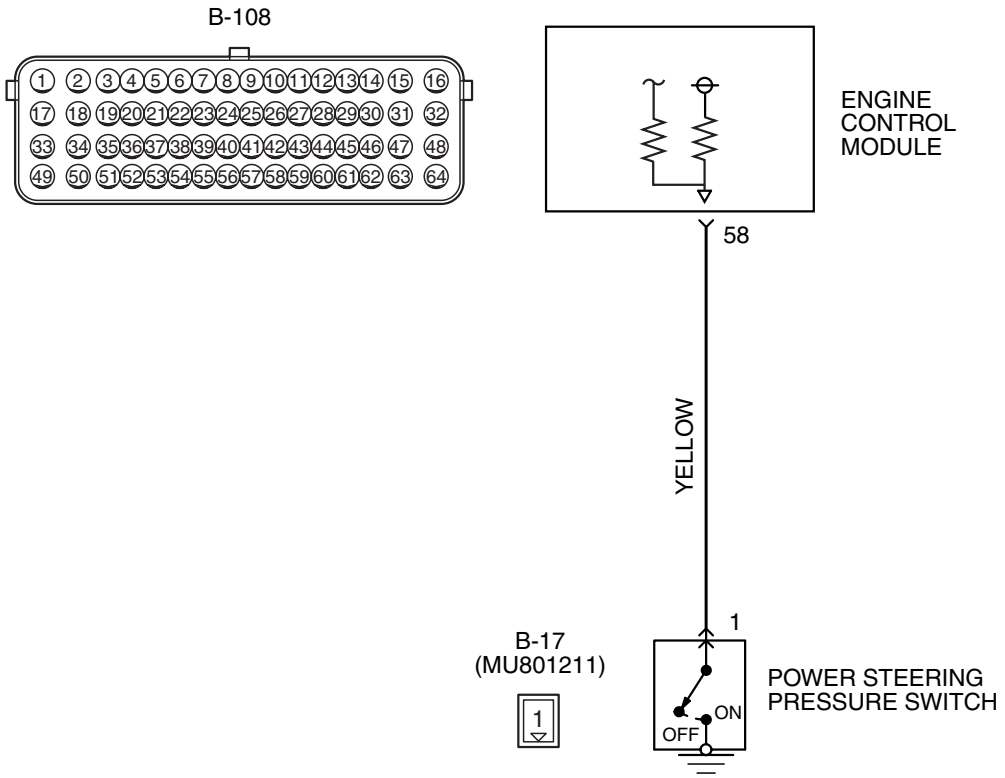
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the switch operating properly?

YES : The inspection is complete.
NO : Retry the troubleshooting.

DTC P0554: Power Steering Pressure Switch Circuit Intermittent

POWER STEERING PRESSURE SWITCH CIRCUIT



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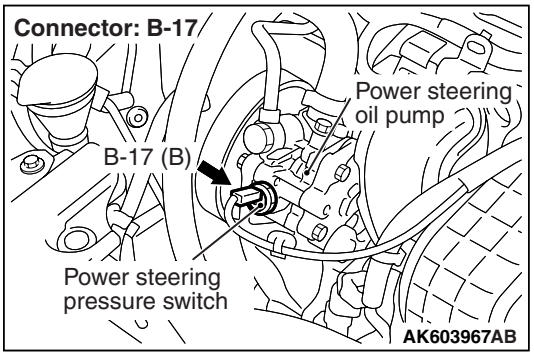

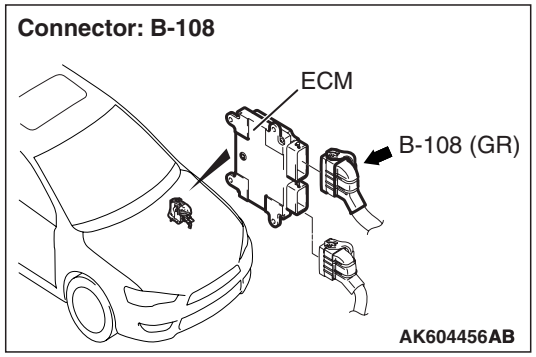

CIRCUIT OPERATION

- A battery positive voltage is applied to the power steering pressure switch output terminal (terminal No. 1) from the ECM (terminal No. 58) via the resistor in the ECM.

TECHNICAL DESCRIPTION

- The power steering pressure switch converts the existence of a power steering load into a high/low voltage, and inputs it into the ECM.

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- When the steering wheel is turned, hydraulic pressure rises. The power steering pressure switch closes, and the applied battery positive voltage will be grounded. With this, the power steering pressure switch output voltage will fluctuate between 0 and 12 volts.
- While driving with the steering wheel held straight, the power steering pressure switch turns "OFF".
- The ECM checks whether the power steering pressure switch turns "OFF" or "ON" during driving.

DESCRIPTIONS OF MONITOR METHODS

Power steering pressure switch changes from off to on more than 10 times for 1 second.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

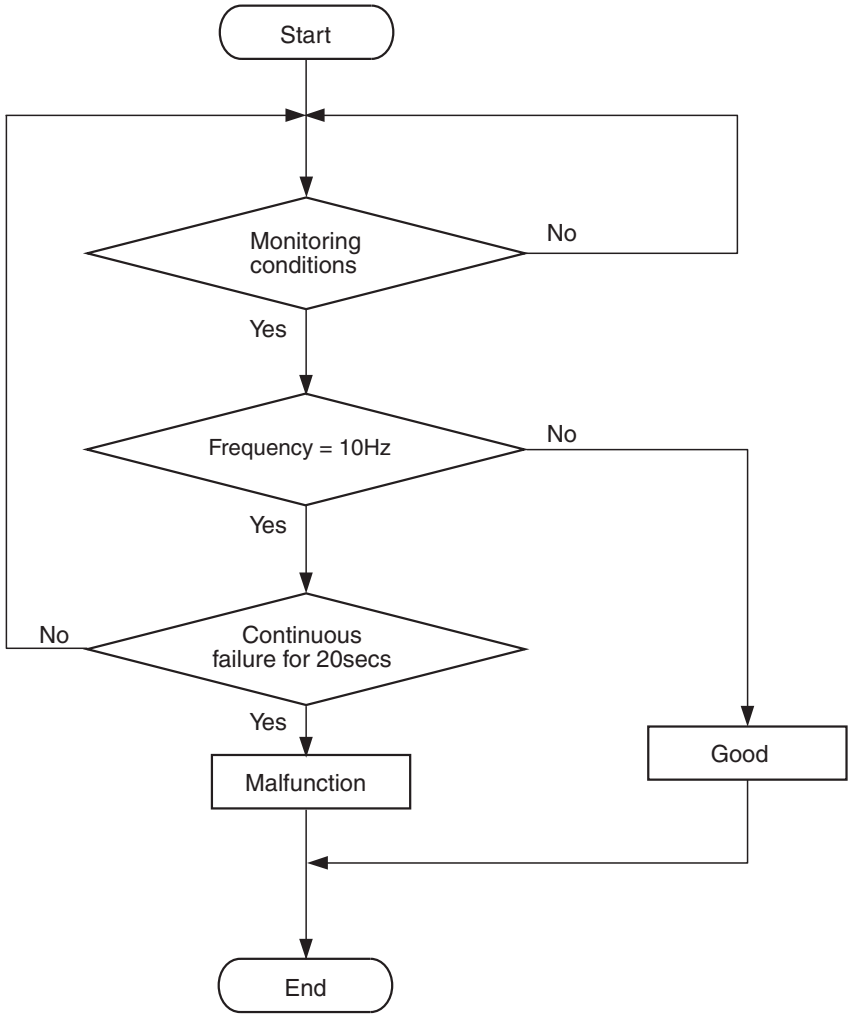
- Not applicable

Sensor (The sensor below is determined to be normal)

- Engine coolant temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Engine coolant temperature is higher than 20° C (68° F).
- Vehicle speed is higher than 50 km/h (31 mph).

Judgement Criterion

- The ON/OFF frequency of a power steering pressure switch is 10 Hz or more for 20 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Power steering pressure switch failed.
- Incorrect power steering fluid level.
- Incorrect oil pump pressure.
- Harness damage in power steering pressure switch circuit, or connector damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 17 P.13A-10

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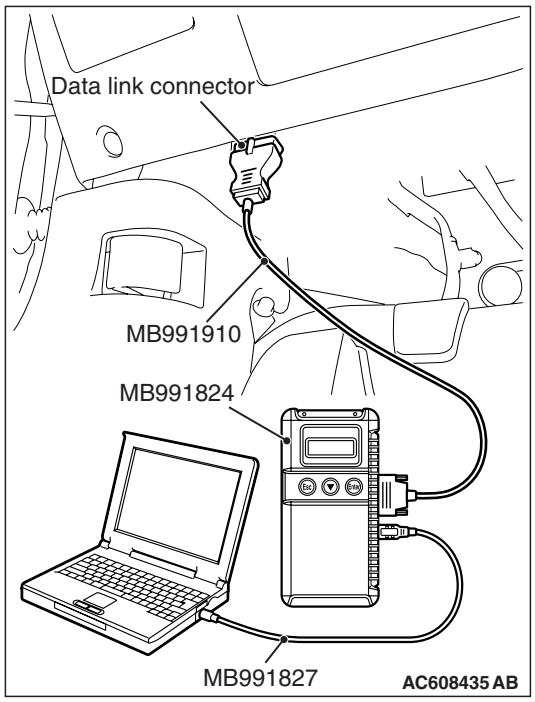
DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 83: Power Steering Pressure Switch.



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Set scan tool MB991958 to the data reading mode for item 83, Power Steering Pressure Switch.
  - If the steering wheel is not turned while idling, "OFF" will be displayed.
  - If the steering wheel is turned while idling, "ON" will be displayed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check the power steering fluid level.

Refer to GROUP 37, On-vehicle Service –Fluid Level Check P.37-16.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.
NO : Go to Step 3.

STEP 3. Check the power steering pressure switch.

Refer to GROUP 37, On-vehicle Service –Power Steering Pressure Switch CheckP.37-19.

Q: Are there any abnormalities?

YES : Replace the power steering pressure switch. Then go to Step 7.
NO : Go to Step 4.

STEP 4. Check the oil pump pressure.
Refer to GROUP 37, On-vehicle Service –Oil Pump Pressure Test P.37-18.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 7.
NO : Go to Step 5.

STEP 5. Check harness connector B-17 at the power steering pressure switch and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 6. Check for harness damage between power steering pressure switch connector B-17 (terminal No. 1) and ECM connector B-108 (terminal No. 58).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.
NO : Repair it. Then go to Step 7.

STEP 7. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0554 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0603: EEPROM Malfunction

TECHNICAL DESCRIPTION

- ECM stored the information such as the idle learned value and so on in the memory of ECM.

DESCRIPTIONS OF MONITOR METHODS

To check whether the information such as the idle learned value and so on is stored in the memory of ECM.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

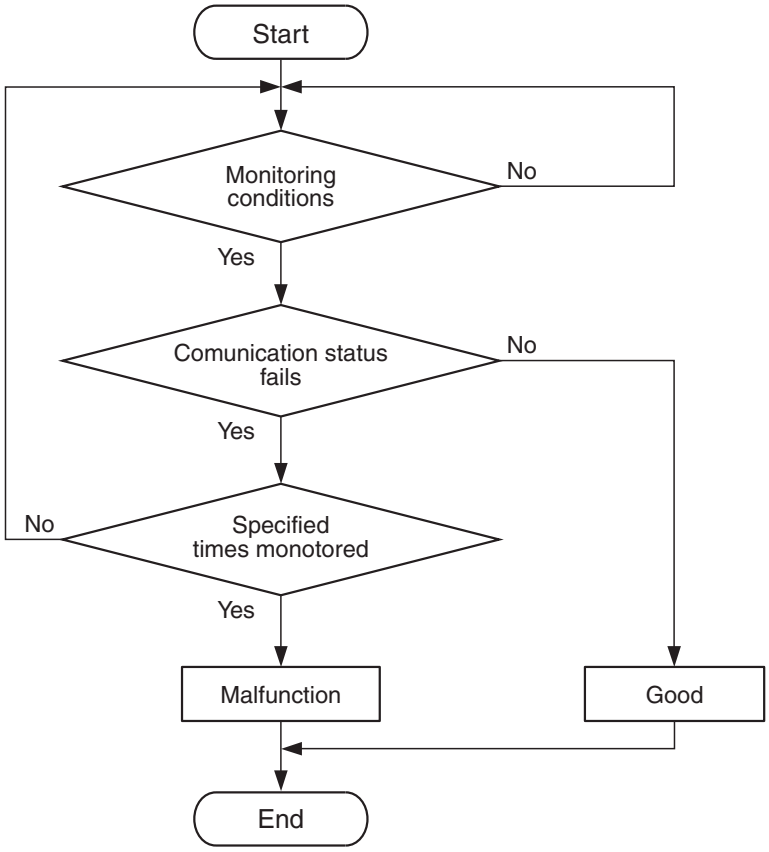
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

Judgement Criterion
- The latest data that was flashed while the ignition switch was in "LOCK" (OFF) position are not stored correctly.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

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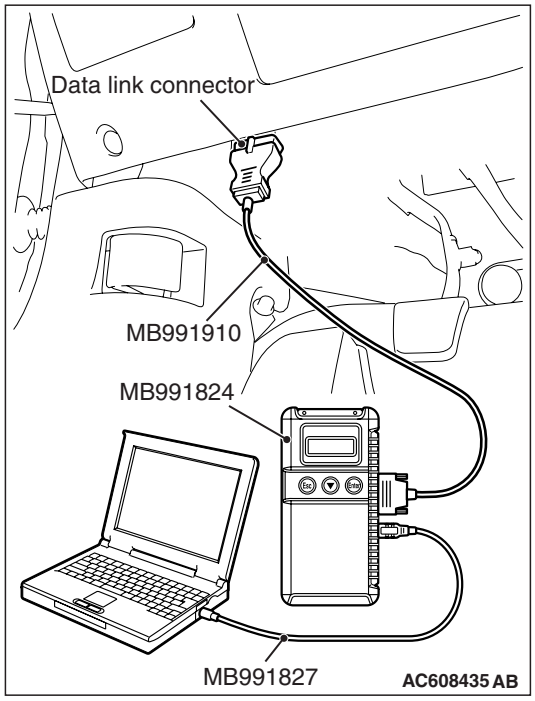


STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC)

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0603 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P0606: Powertrain Control Module Main Processor Malfunction

TECHNICAL DESCRIPTION

- Throttle actuator control processor checks the ECM for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

No watch dog pulse is detected.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- No surveillance pulse signals should be input for 0.5 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

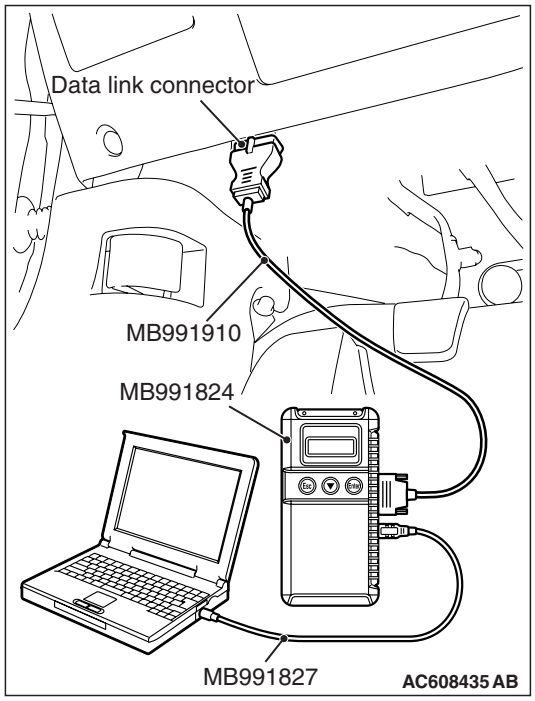
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC)



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

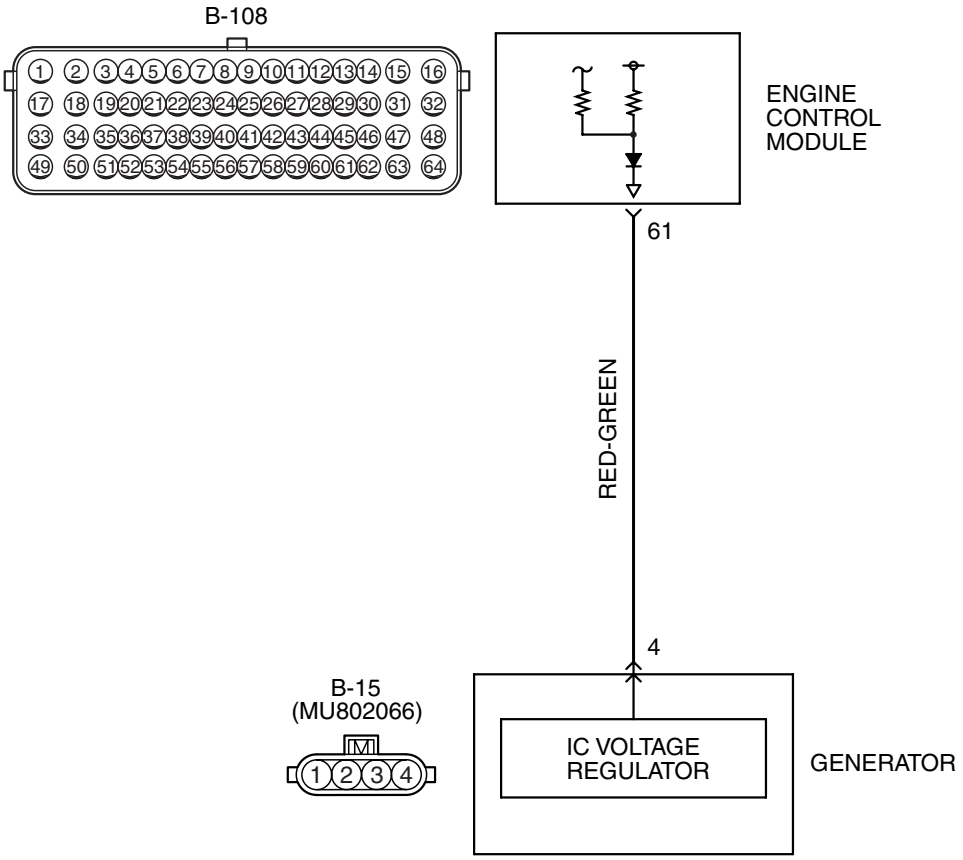
Q: Is DTC P0606 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P0622: Generator FR Terminal Circuit Malfunction

GENERATOR CIRCUIT



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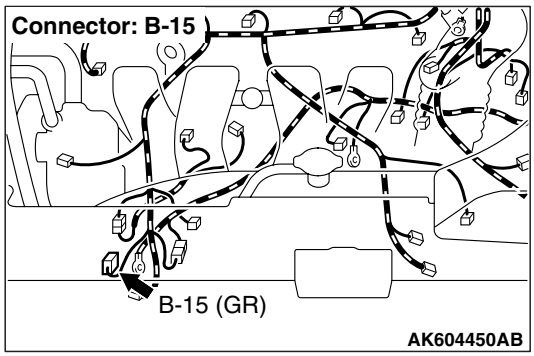

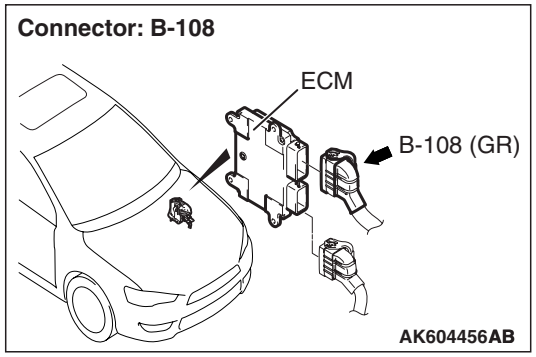

CIRCUIT OPERATION

- The ECM (terminal No. 61) apply a battery voltage into the generator FR terminal No. 4 via resistance inside the unit.

TECHNICAL DESCRIPTION

- When the generator field coils are controlled, the generator FR terminal inputs signal to the ECM.
- The ECM detects the generator output with the input signal, and controls the idle air control motor according to the generator output.

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DTC SET CONDITIONS

Check Condition

- Engine speed is higher than 50 r/min.

Judgement Criterion

- Input voltage from the generator FR terminal has continued to be battery positive voltage for 20 seconds.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set area:)

- Generator failed.
- Open circuit in generator FR terminal circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness

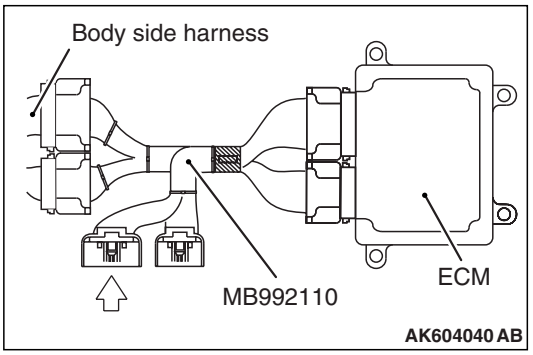
STEP 1. Check harness connector B-108 at ECM connector for damage.

Q: Is the harness connector in good condition?

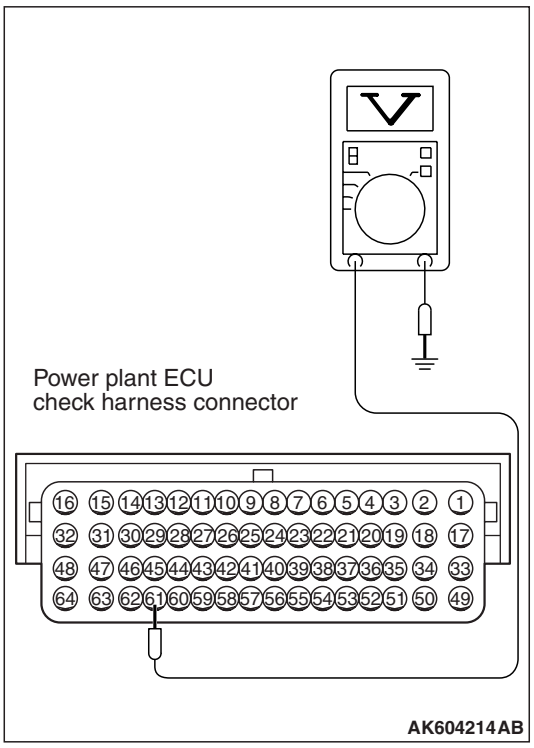
YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 2. Measure the voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Start the engine and run at idle.

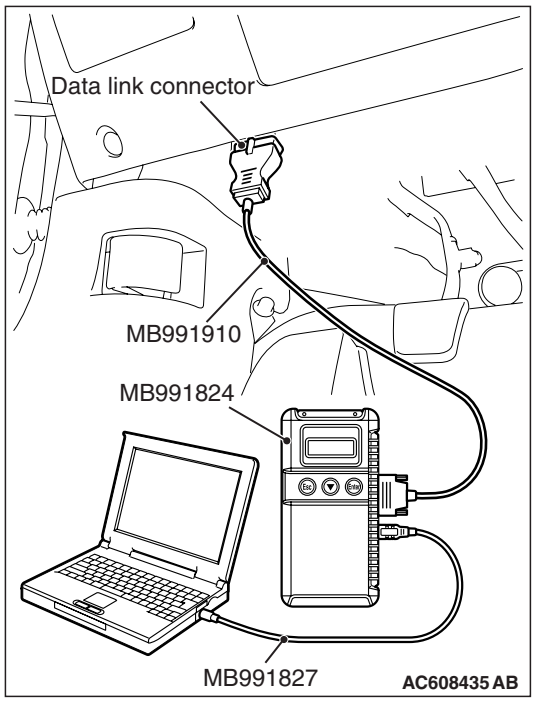


(3) Measure the voltage between terminal No. 61 and ground.
NOTE: Vehicle for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.
a. Engine: warming up
b. Radiator fan: stopped
c. Headlight switch: OFF to ON
d. Rear defogger switch: OFF to ON
e. Stoplight switch: OFF to ON
- Voltage should be drop.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Did the measured voltage drop?

YES : Go to Step 3.
NO : Go to Step 4.



STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0622 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Check harness connector B-15 at generator connector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Measure the voltage at generator harness side connector B-15.

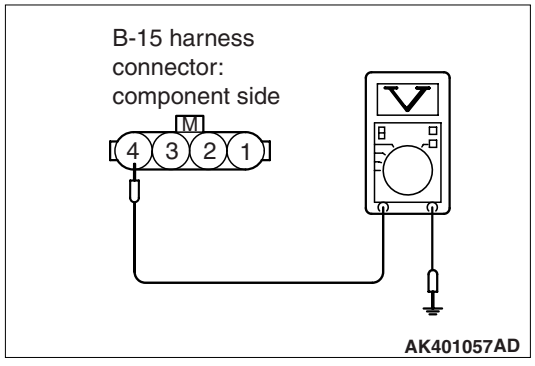
(1) Disconnect the connector B-15 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

NO : Go to Step 6.



STEP 6. Check for open circuit and short circuit to ground between generator connector B-15 (terminal No. 4) and ECM connector B-108 (terminal No. 61).

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

NO : Repair it. Then go to Step 8.

STEP 7. Check for harness damage between generator connector B-15 (terminal No. 4) and ECM connector B-108 (terminal No. 61).

Q: Is the harness wire in good condition?

YES : Replace the generator. Then go to Step 8.

NO : Repair it. Then go to Step 8.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

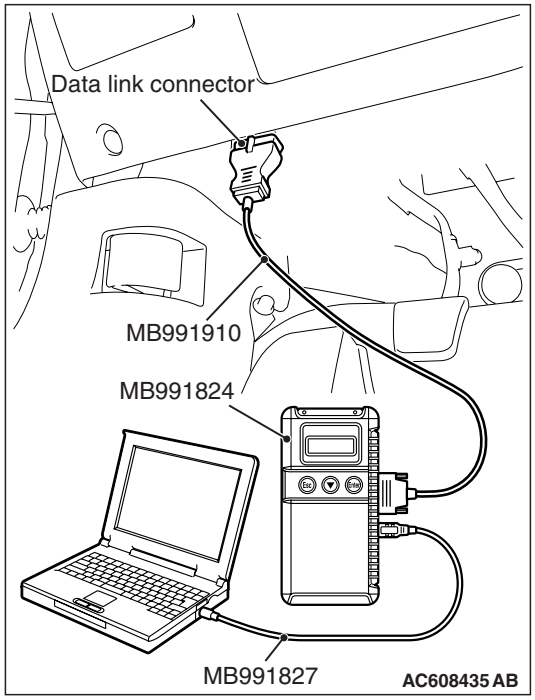
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Start the engine and run at idle.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0622 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.



DTC P0630: Vehicle Identification Number (VIN) Malfunction

TECHNICAL DESCRIPTION

- The Vehicle Identification Number (VIN) is stored in the ECM by the vehicle manufacturer.

DESCRIPTIONS OF MONITOR METHODS

The ECM checks whether the VIN is being entered or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

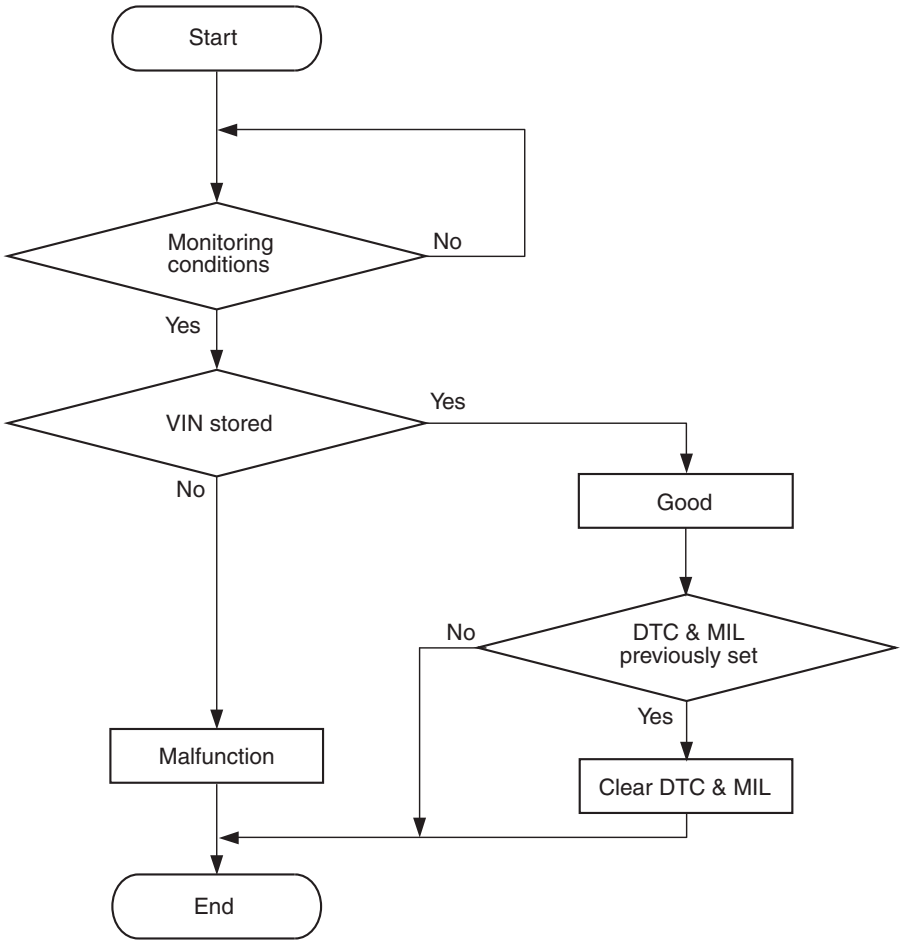
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- VIN (current) has not been written.

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OBD-II DRIVE CYCLE PATTERN

None.

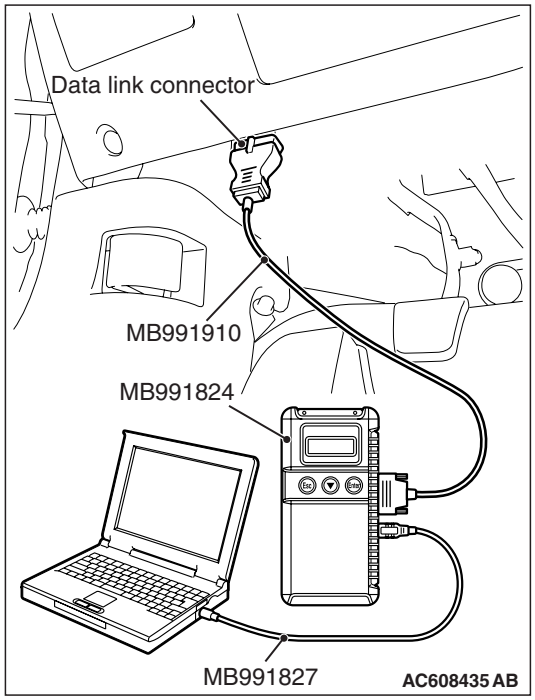
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, check VIN Information.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Set scan tool MB991958 to the coding mode for VIN Information.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Has VIN (current) been written?

YES : Go to Step 2.
NO : Write VIN. Then go to Step 3.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC)

(1) Turn the ignition switch to the "ON" position.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0630 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC)
(1) Turn the ignition switch to the "ON" position.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P0630 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : The inspection is complete.

DTC P0638: Throttle Actuator Control Motor Circuit Range/Performance Problem

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P2101 –Throttle Actuator Control Motor Magneto Malfunction P.13A-718.

CIRCUIT OPERATION

- Refer to DTC P2101 –Throttle Actuator Control Motor Magneto Malfunction P.13A-718.

TECHNICAL DESCRIPTION

- ECM checks the electronic controlled throttle system for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Difference between throttle position sensor (main) output and target opening is greater than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Drop of throttle position sensor (main) output voltage per 100 milliseconds is more than 0.04 volt.

Judgement Criterion

- Throttle position sensor (main) output voltage has continued to be higher than the target throttle position sensor (main) voltage by 0.5 volt or more for 0.4 second.

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Target throttle position sensor (main) output voltage is 1.5 volts or lower.

Judgement Criterion

- Difference between throttle position sensor (main) output voltage and target throttle position sensor (main) voltage is 0.6 volt or higher for 0.4 second.

Check Conditions

- Battery positive voltage is higher than 8.3 volts.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.

Judgement Criterion

- Difference between throttle position sensor (main) output voltage and target throttle position sensor (main) voltage is 1 volt or higher for 0.4 second.

Check Conditions
- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion
- Throttle position sensor (main) default opening learnt value is higher than 4 volts.

OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Throttle valve return spring failed.
- Throttle valve operation failed.
- Throttle actuator control motor failed.
- Harness damage in throttle actuator control motor circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-10 at throttle actuator control motor for damage.

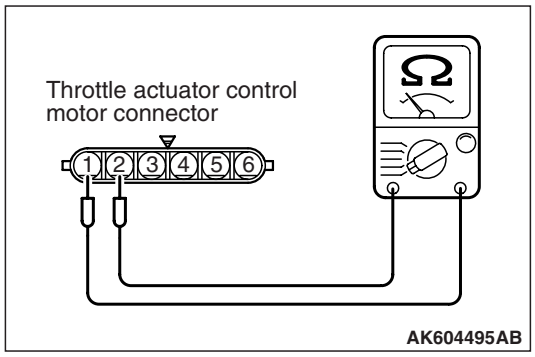
Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7..

STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-10.
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 –80 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 0.3 and 80 ohms [at 20° C (68° F)]?

YES : Go to Step 3.
NO : Replace the throttle body assembly. Then go to Step 7.

STEP 3. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 4. Check for harness damage between throttle actuator control motor connector B-10 (terminal No. 1) and ECM connector B-108 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 7.

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STEP 5. Check for harness damage between throttle actuator control motor connector B-10 (terminal No. 2) and ECM connector B-108 (terminal No. 16).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 7.

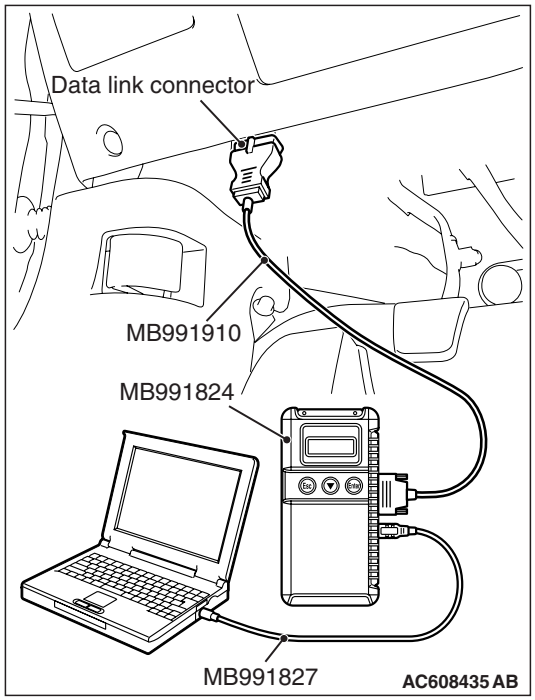
STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

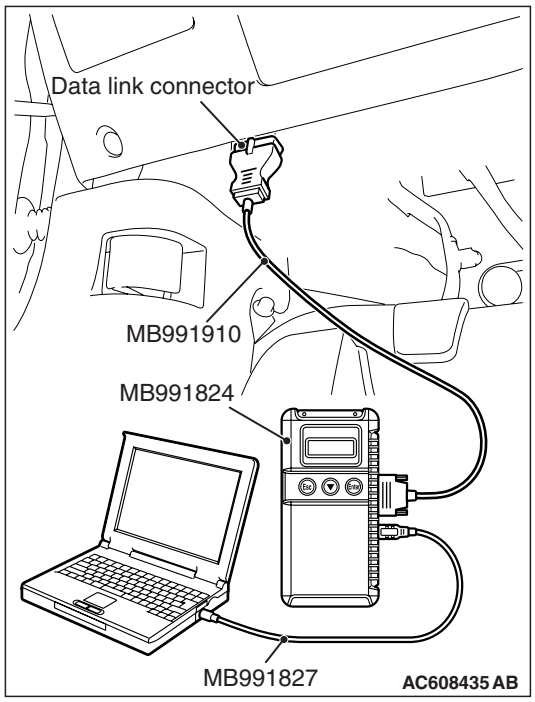
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0638 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.





STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0638 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P0642: Throttle Position Sensor Power Supply

TECHNICAL DESCRIPTION

- ECM checks the throttle position sensor power voltage for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Throttle position sensor source voltage is smaller than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Conditions

- Battery positive voltage is higher than 6.3 volts.

Judgement Criteria

- Throttle position sensor power voltage should be 4.1 volts or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)

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- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

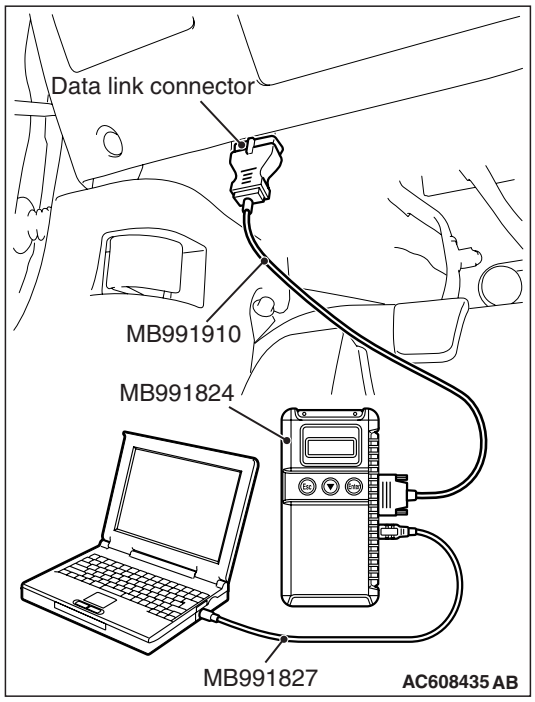
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK"(OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK"(OFF) position.

Q: Is DTC P0642 set?

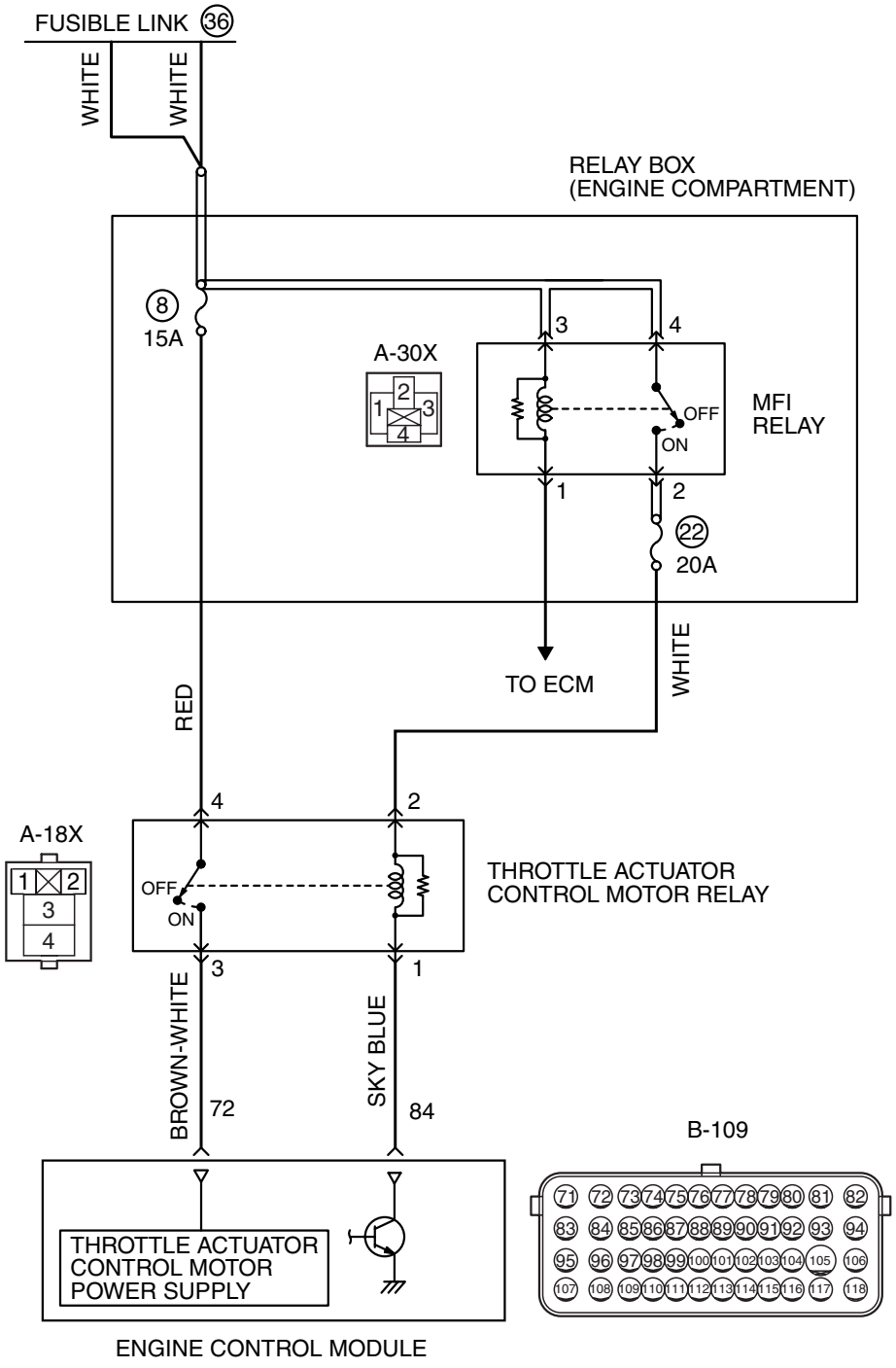
YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



DTC P0657: Throttle Actuator Control Motor Relay Circuit Malfunction

THROTTLE ACTUATOR CONTROL MOTOR RELAY CIRCUIT



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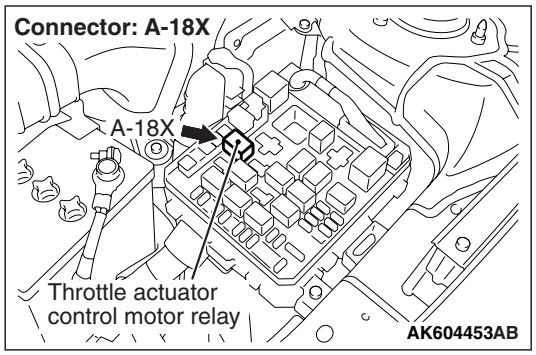
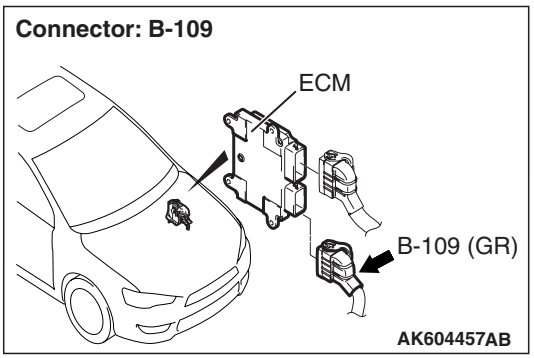
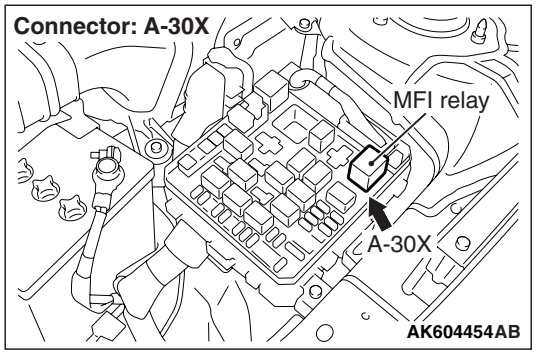






CIRCUIT OPERATION

- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 4).
- Battery positive voltage is applied to the throttle actuator control motor relay terminal (terminal No. 2) from the MFI relay (terminal No. 2).
- ECM (terminal No. 84) applies current to the throttle actuator control motor relay coil by turning ON the power transistor in the unit in order to turn the relay ON.
- When the throttle actuator control motor relay turns ON, battery positive voltage is supplied by the throttle actuator control motor relay (terminal No. 3) to the ECM (terminal No. 72).

TECHNICAL DESCRIPTION

- When the ignition switch ON signal is input into the ECM, the ECM turns ON the throttle actuator control motor relay.

DESCRIPTIONS OF MONITOR METHODS

Throttle actuator control motor relay circuit voltage is smaller than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- The power line voltage of the electronic controlled throttle valve system should be 6.0 volts or less for 0.35 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor relay failed.
- Open or shorted throttle actuator control motor relay circuit, or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector A-18X at throttle actuator control motor relay for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

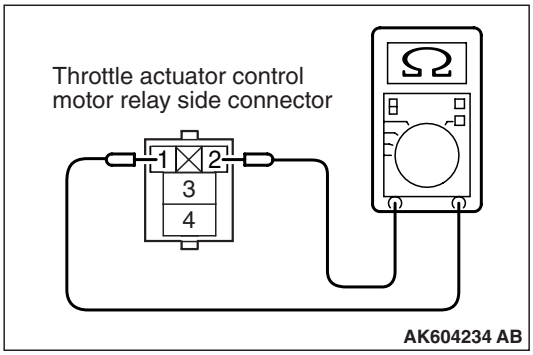
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

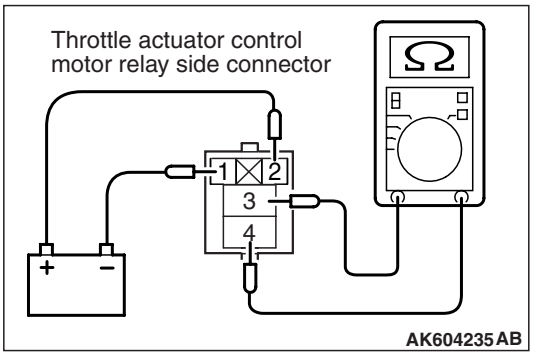
STEP 2. Check the throttle actuator control motor relay.

(1) Remove the throttle actuator control motor relay.

(2) Check for continuity between the throttle actuator control motor relay terminal No. 1 and No. 2.

- There should be continuity (approximately 70 ohms).





(3) Use jumper wires to connect throttle actuator control motor relay terminal No. 2 to the positive battery terminal and terminal No. 1 to the negative battery terminal.

(4) Check the continuity between the throttle actuator control motor relay terminal No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

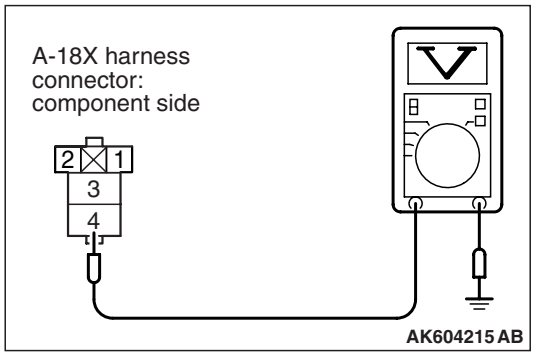
- Continuity (2 ohms or less) <Negative battery terminal connected.>
- Should be open loop. <Negative battery terminal disconnected.>

(5) Install the throttle actuator control motor relay.

Q: Is the measured resistance normal?

YES : Go to Step 3.

NO : Replace the throttle actuator control motor relay. Then go to Step 14.

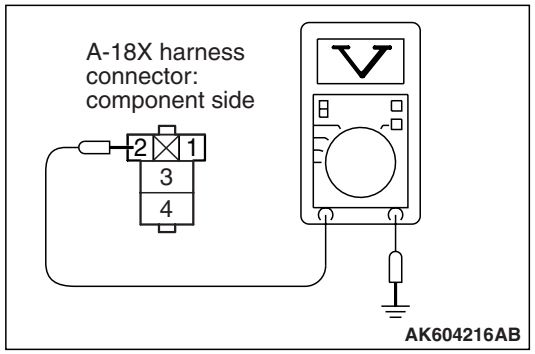


STEP 3. Measure the power supply voltage at throttle actuator control motor relay harness side connector A-18X

(1) Disconnect the connector A-18X and measure at the harness side.
(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.
NO : Repair it harness wire between battery and throttle actuator control motor relay connector A-18X (terminal No. 4) because of open circuit or short circuit to ground. Then go to Step 14.



STEP 4. Measure the power supply voltage at throttle actuator control motor relay harness side connector A-18X.

(1) Disconnect the connector A-18X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 2 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

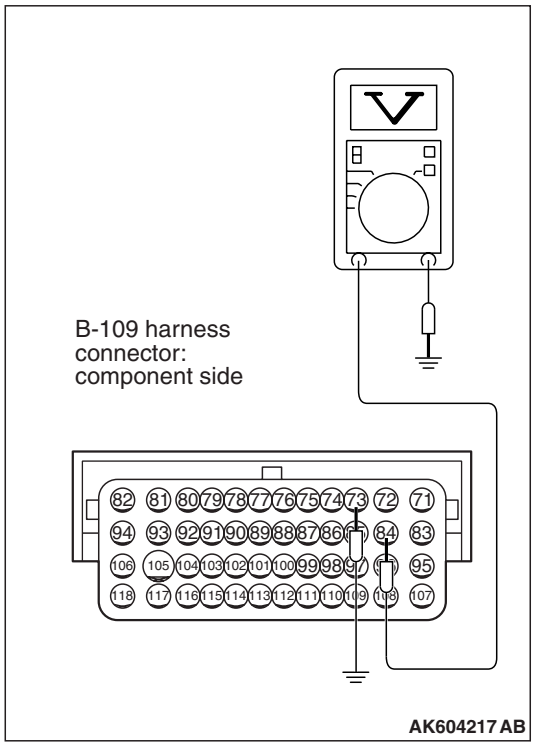
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Go to Step 5.

STEP 5. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and throttle actuator control motor relay connector A-18X (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 14.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.



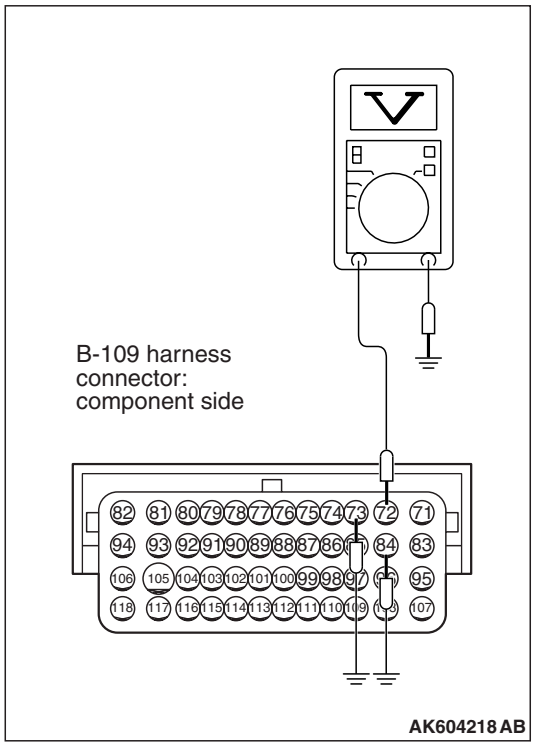
STEP 6. Measure the power supply voltage at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Short-circuit the terminal No. 73 of the ECM harness connector to the ground.
(3) Measure the voltage between terminal No. 84 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.

NO : Repair harness wire between throttle actuator control motor relay connector A-18X (terminal No. 1) and ECM connector B-109 (terminal No. 84) because of open circuit or short circuit to ground. Then go to Step 14.



STEP 7. Measure the power supply voltage at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Short-circuit the terminals No. 73 and No. 84 of the ECM harness connector to the ground.
(3) Measure the voltage between terminal No. 72 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 10.
NO : Go to Step 8.

STEP 8. Check for open circuit and short circuit to ground between throttle actuator control motor relay connector A-18X (terminal No. 3) and ECM connector B-109 (terminal No. 72).

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 14.

STEP 9. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and throttle actuator control motor relay connector A-18X (terminal No. 2).

Q: Is the harness wire in good condition?

YES : Repair harness wire between throttle actuator control motor relay connector A-18X (terminal No. 1) and ECM connector B-109 (terminal No. 84) because of harness damage. Then go to Step 14.
NO : Repair it. Then go to Step 14.

STEP 10. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 14.

STEP 11. Check for harness damage between battery and throttle actuator control motor relay connector A-18X (terminal No. 4).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 14.

STEP 12. Check for harness damage between throttle actuator control motor relay connector A-18X (terminal No. 3) and ECM connector B-109 (terminal No. 72).

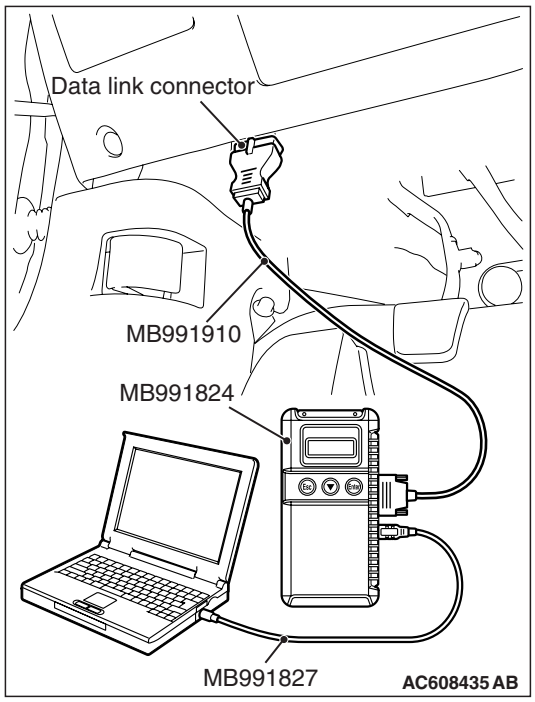
Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 14.

STEP 13. Using scan tool MB991958, read the diagnostic trouble code (DTC).

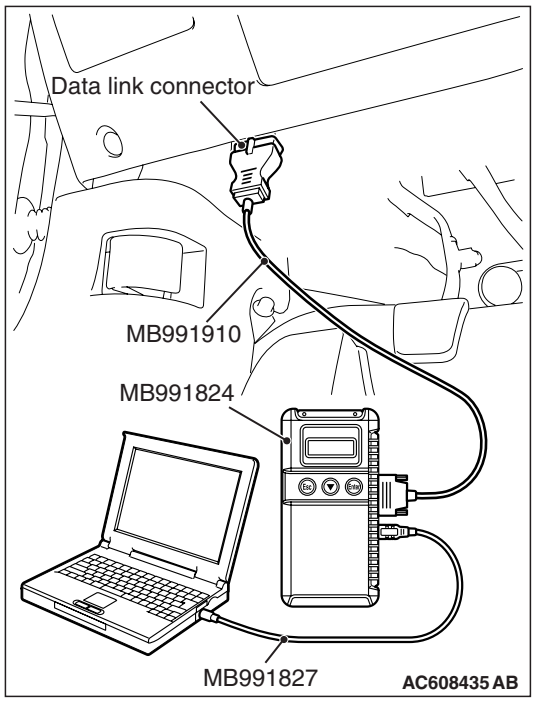
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is DTC P0657 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 14.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



STEP 14. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

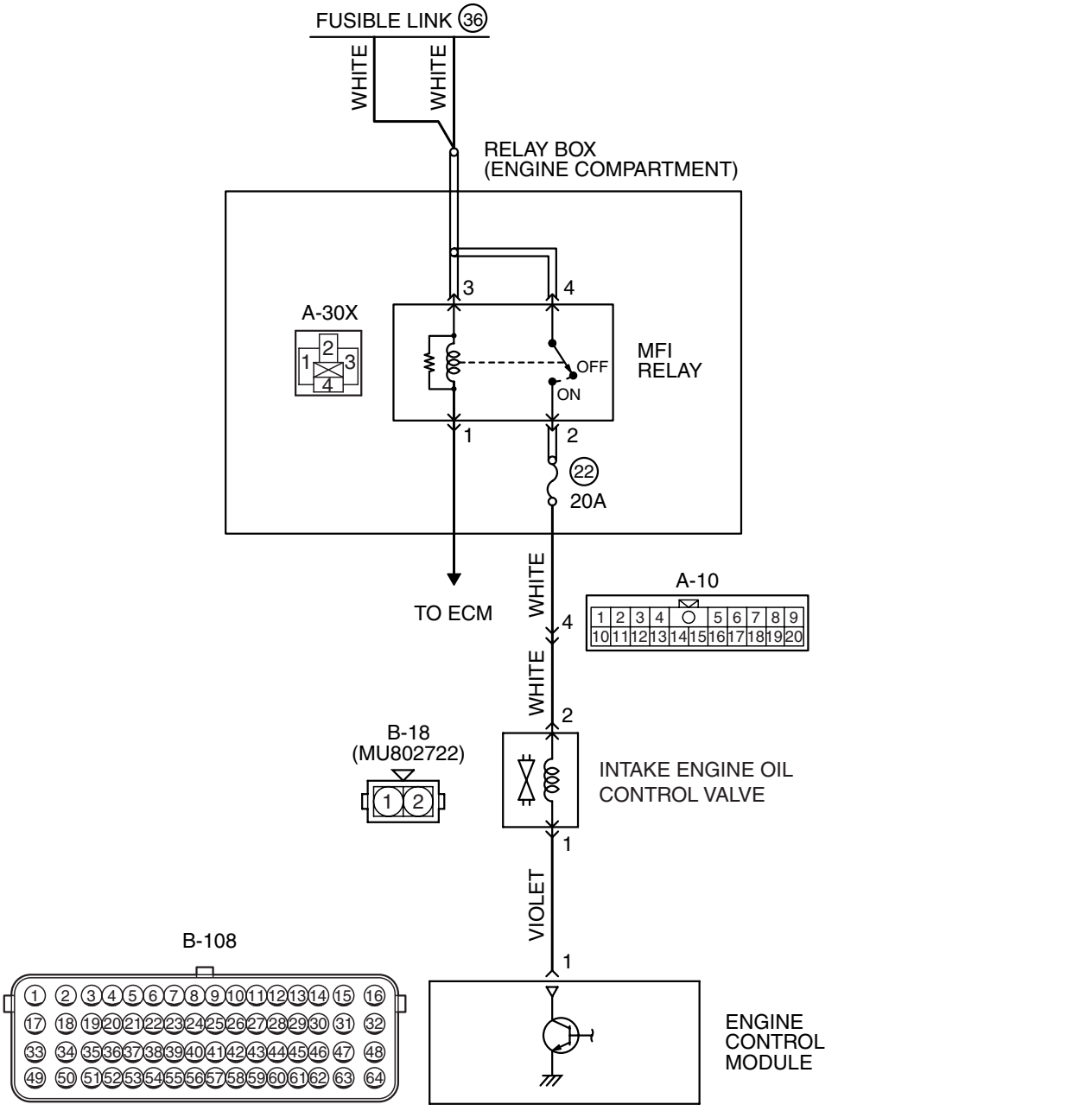
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0657 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1021: Intake Engine Oil Feeder Control Valve Circuit

INTAKE ENGINE OIL CONTROL VALVE CIRCUIT



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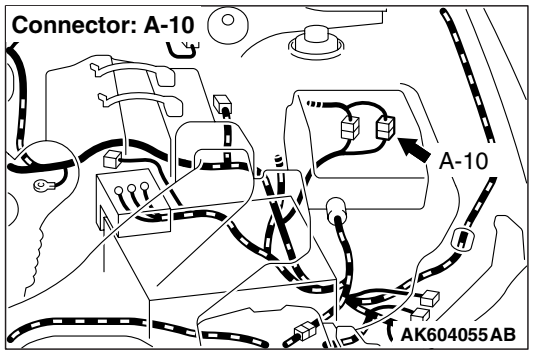
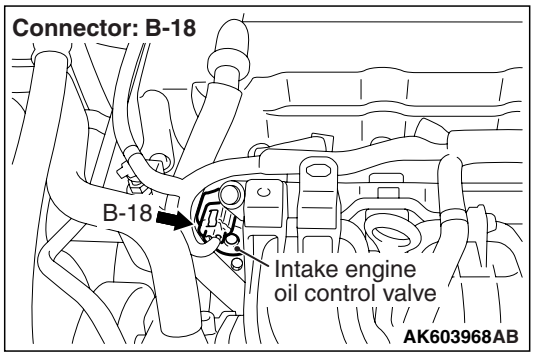
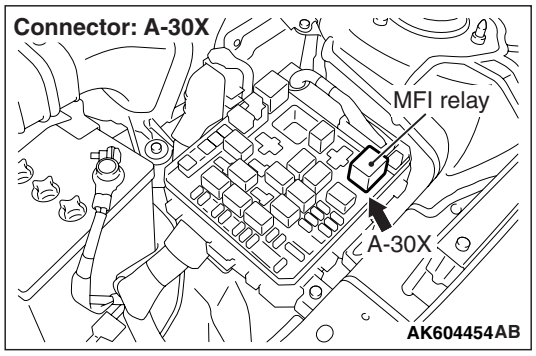
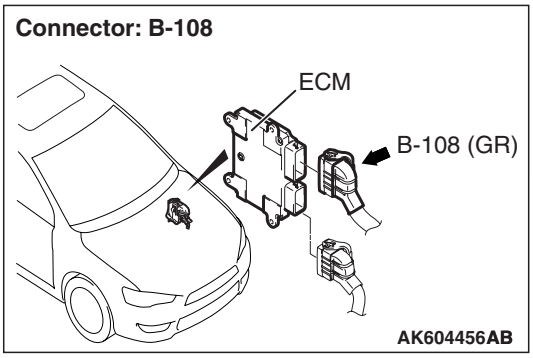








CIRCUIT OPERATION

- The intake engine oil control valve power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground intake engine oil control valve by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The intake engine oil control valve change the phase angle to operate the MIVEC system in the advance or retard side in accordance with the signals from the ECM.

DESCRIPTIONS OF MONITOR METHODS

Intake engine oil control valve circuit voltage is less than specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

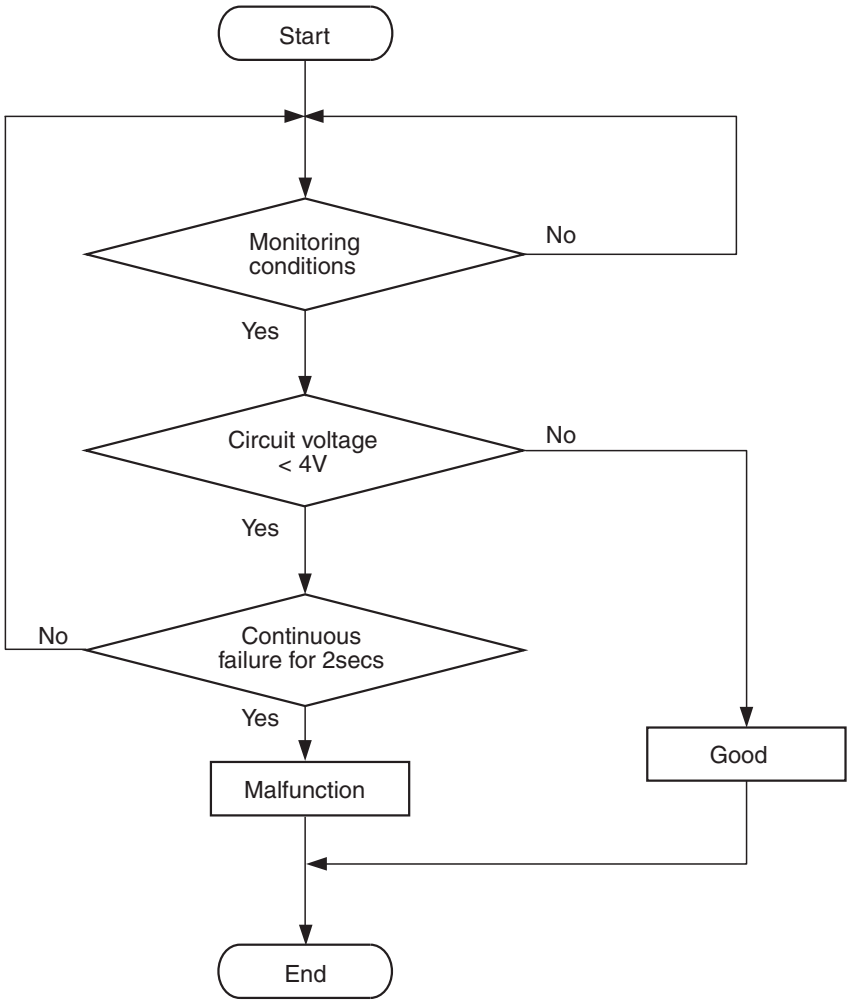
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Ignition switch is "ON" position
- Intake engine oil control valve is "OFF".
- Battery positive voltage is between 10 and 16.5 volts.
- 0.1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion

- The ECM terminal voltage of intake engine oil control valve circuit is less than 4 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake engine oil control valve failed.
- Open or shorted intake engine oil control valve circuit, or harness damage, or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB992110: Power Plant ECU Check Harness

STEP 1. Check harness connector B-18 at the intake engine oil control valve for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

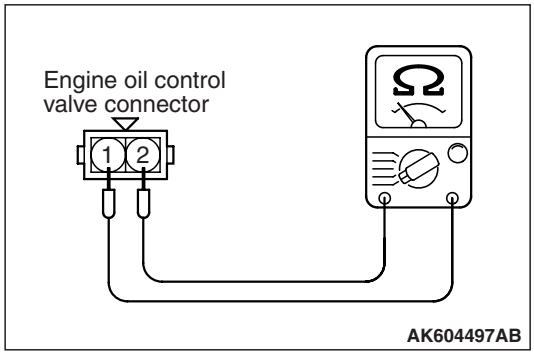
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 2. Check the intake engine oil control valve.

(1) Disconnect the intake engine oil control valve connector B-18.

(2) Measure the resistance between intake engine oil control valve side connector terminal No. 1 and No. 2.

Standard value: 6.9 –7.9 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 6.9 and 7.9 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the intake engine oil control valve. Then go to Step 10.

STEP 3. Measure the power supply voltage at intake engine oil control valve harness side connector B-18.

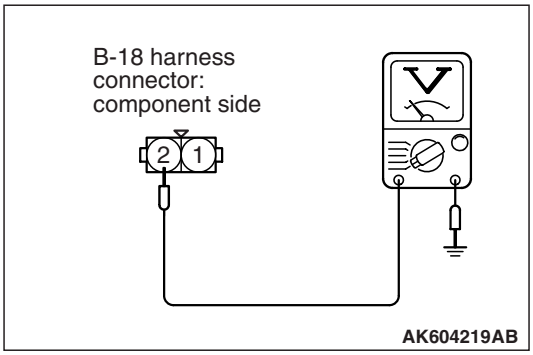
(1) Disconnect the connector B-18 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 2 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and intake engine oil control valve connector B-18 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

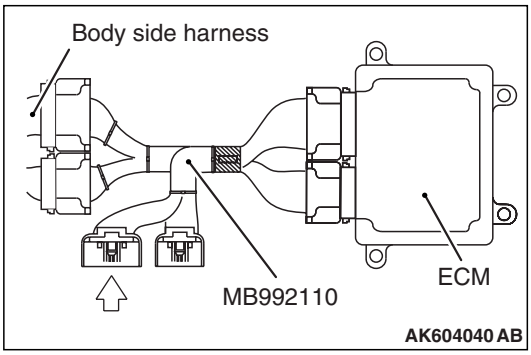
STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

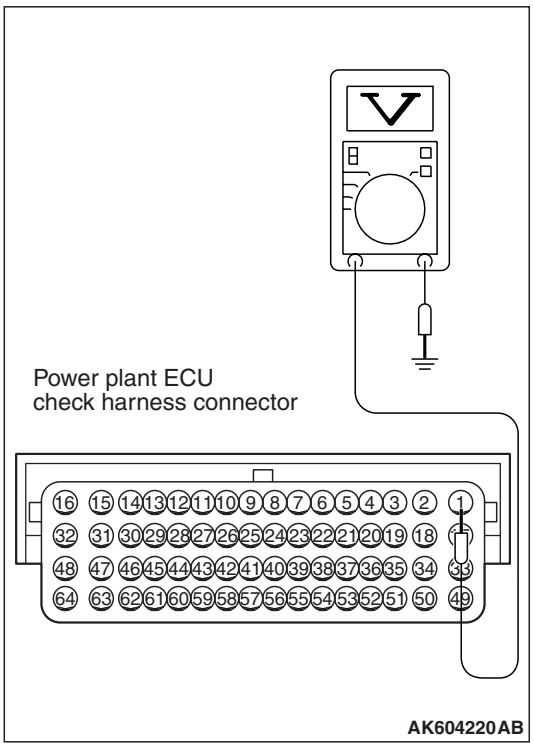
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.
NO : Repair harness wire between intake engine oil control valve connector B-18 (terminal No. 1) and ECM connector B-108 (terminal No. 1) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 7. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and intake engine oil control valve connector B-18 (terminal No. 2).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 10.

STEP 8. Check for harness damage between intake engine oil control valve connector B-18 (terminal No. 1) and ECM connector B-108 (terminal No. 1).

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 10.

STEP 9. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1021 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 10. Test the OBD-II drive cycle.

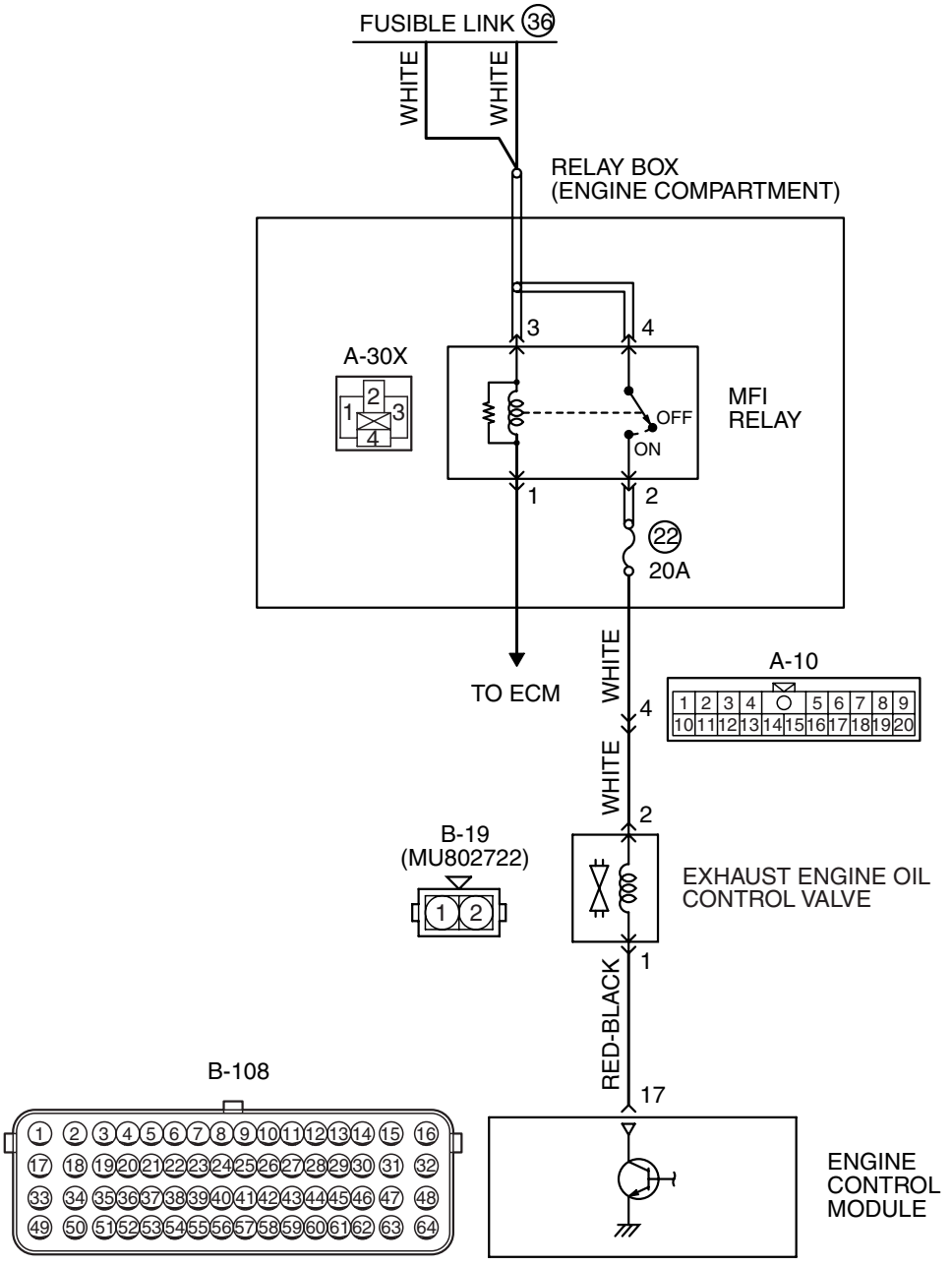
(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1021 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1025: Exhaust Engine Oil Control Valve Circuit

EXHAUST ENGINE OIL CONTROL VALVE CIRCUIT



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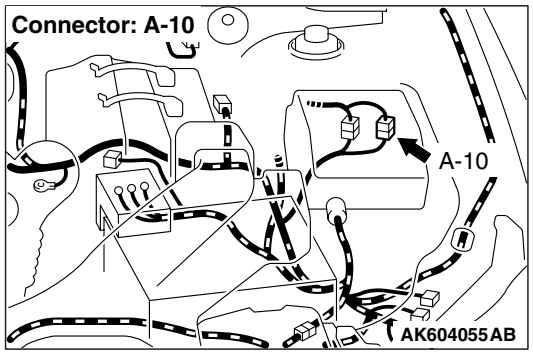
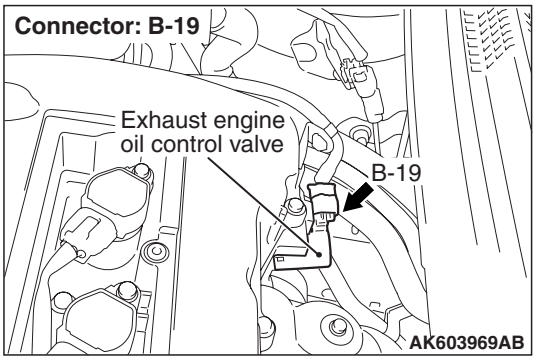
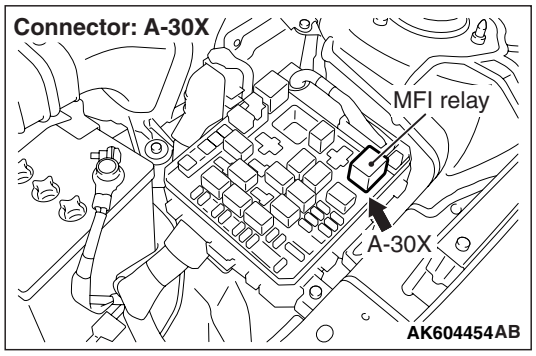
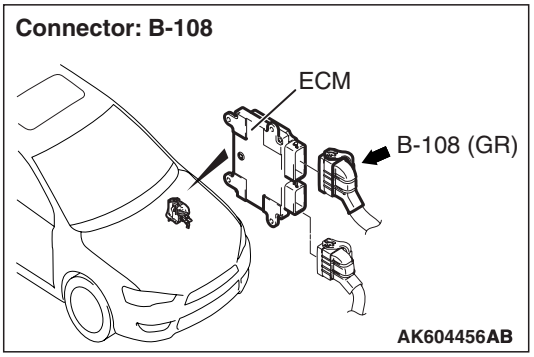








CIRCUIT OPERATION

- The exhaust engine oil control valve power is supplied from the MFI relay (terminal No. 2).
- The ECM controls ground exhaust engine oil control valve by turning the power transistor in the ECM "ON" and "OFF".

TECHNICAL DESCRIPTION

- The exhaust engine oil control valve change the phase angle to operate the MIVEC system in the advance or retard side in accordance with the signals from the ECM.

DESCRIPTIONS OF MONITOR METHODS

Exhaust engine oil control valve circuit voltage is less than specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

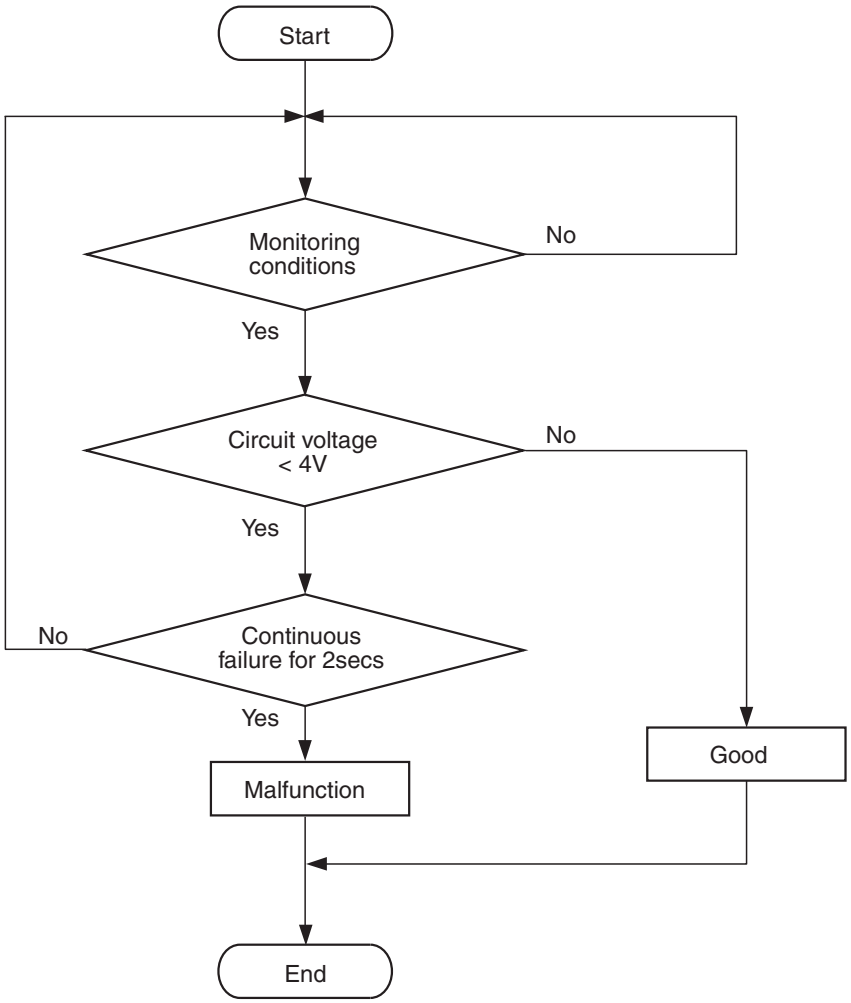
- Not applicable

Sensor (The sensor below is determined to be normal)

- Camshaft position sensor
- Crankshaft position sensor
- Engine coolant temperature sensor
- Throttle position sensor
- Engine oil control valve

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Ignition switch is "ON" position.
- Exhaust engine oil control valve is "OFF".
- Battery positive voltage is between 10 and 16.5 volts.
- 0.1 second has elapsed after the above mentioned conditions have been met.

Judgement Criterion

- The ECM terminal voltage of exhaust engine oil control valve circuit is less than 4 volts for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Exhaust engine oil control valve failed.
- Open or shorted exhaust engine oil control valve circuit, or harness damage, or connector damage.
- ECM failed.

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DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991911: Main Harness B
- MB992110:Power Plant ECU CHeck Harness

STEP 1. Check harness connector B-19 at the exhaust engine oil control valve for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

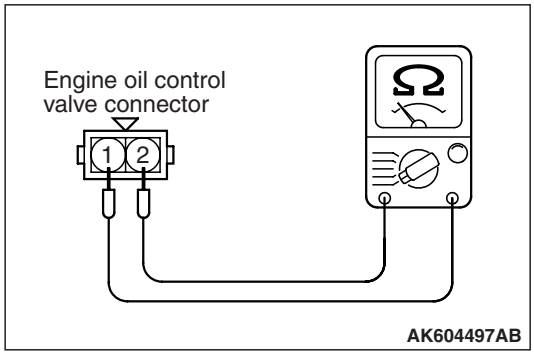
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 2. Check the exhaust engine oil control valve.

(1) Disconnect the exhaust engine oil control valve connector B-19.

(2) Measure the resistance between exhaust engine oil control valve side connector terminal No. 1 and No. 2.

Standard value: 6.9 –7.9 ohms [at 20° C (68° F)]



Q: Is the measured resistance between 6.9 and 7.9 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the exhaust engine oil control valve. Then go to Step 10.

STEP 3. Measure the power supply voltage at exhaust engine oil control valve harness side connector B-19.

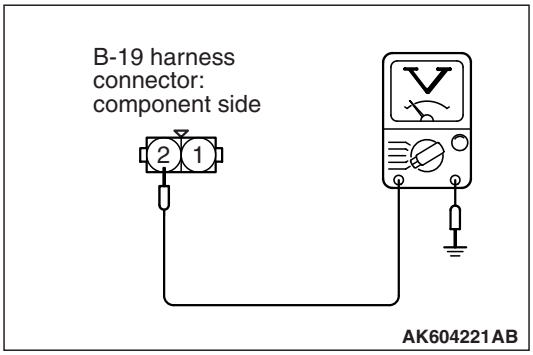
(1) Disconnect the connector B-19 and measure at the harness side.

(2) Turn the ignition switch to the "ON" position.

(3) Measure the voltage between terminal No. 2 and ground.

- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Go to Step 4.

STEP 4. Check harness connector A-30X at MFI relay for damage.

Q: Is the harness connector in good condition?

YES : Check harness connector A-10 at intermediate connector for damage, and repair or replace as required. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connector is in good condition, repair harness wire between MFI relay connector A-30X (terminal No. 2) and exhaust engine oil control valve connector B-19 (terminal No. 2) because of open circuit or short circuit to ground. Then go to Step 10.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

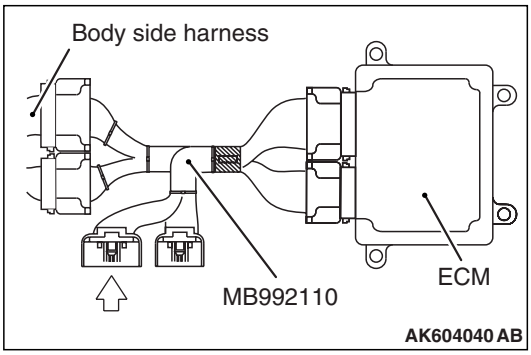
STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

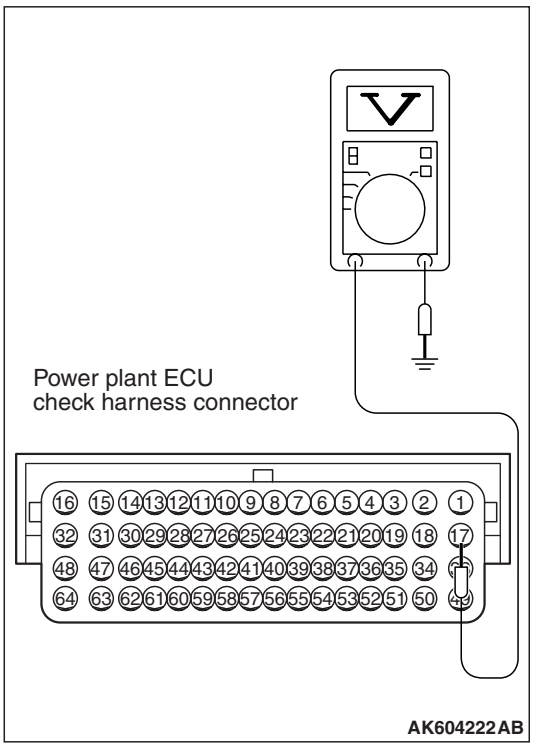
YES : Go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

STEP 6. Measure the power supply voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.
(2) Turn the ignition switch to the "ON" position.



(3) Measure the voltage between terminal No. 17 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 7.
NO : Repair harness wire between exhaust engine oil control valve connector B-19 (terminal No. 1) and ECM connector B-108 (terminal No. 17) because of open circuit or short circuit to ground. Then go to Step 10.

STEP 7. Check for harness damage between MFI relay connector A-30X (terminal No. 2) and exhaust engine oil control valve connector B-19 (terminal No. 2).

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 10.

Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 10.

STEP 8. Check for harness damage between exhaust engine oil control valve connector B-19 (terminal No. 1) and ECM connector B-108 (terminal No. 17).

Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 10.

STEP 9. Check the trouble symptoms.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1025 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 10.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 10. Test the OBD-II drive cycle.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1025 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1231: Active Stability Control Plausibility

TECHNICAL DESCRIPTION

- Checks for an abnormal signal of active stability control (ASC) via the CAN communication.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- A torque demand signal from the active stability control is not normal.

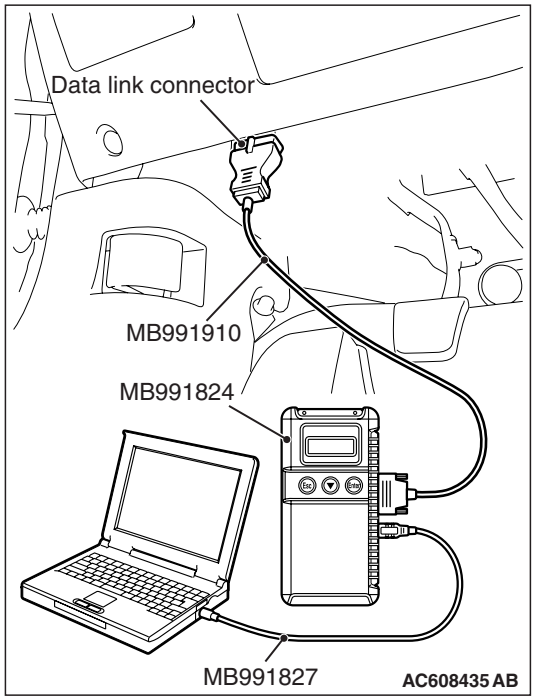
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Active stability control system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1231 set?

YES : Go to Step 2.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the ABS-DTC or ASC-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ABS-DTC or ASC-DTC set?

YES : Refer to GROUP 35B, Anti-lock Braking System – Diagnostic Trouble Code Chart P.35B-8.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1232: Fail Safe System

TECHNICAL DESCRIPTION

- To judge whether fail-safe control can be performed, check that power supply to the throttle actuator control motor circuit can be stopped by turning the throttle actuator control motor relay to OFF position momentarily.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- Power supply to the throttle actuator control motor cannot be shut down (though power supply is stopped).

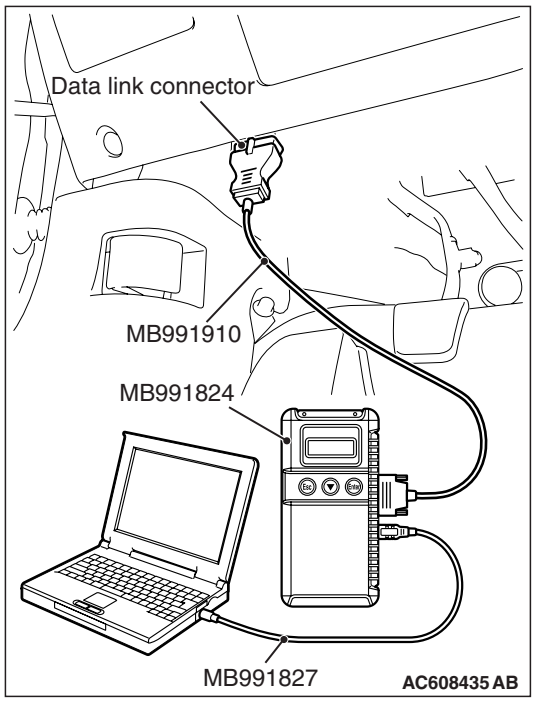
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor relay circuit failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the DTC P1232 set?

YES : Go to Step 2.
NO : It can be assumed that this malfunction is intermittent.Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P0657 set?

YES : Refer to DTC P0657 –Throttle actuator control motor relay circuit malfunction P.13A-638.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1233: Throttle Position Sensor (main) Plausibility

TECHNICAL DESCRIPTION

Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main) signal.

MONITOR EXECUTION

Continuous

TSB Revision

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

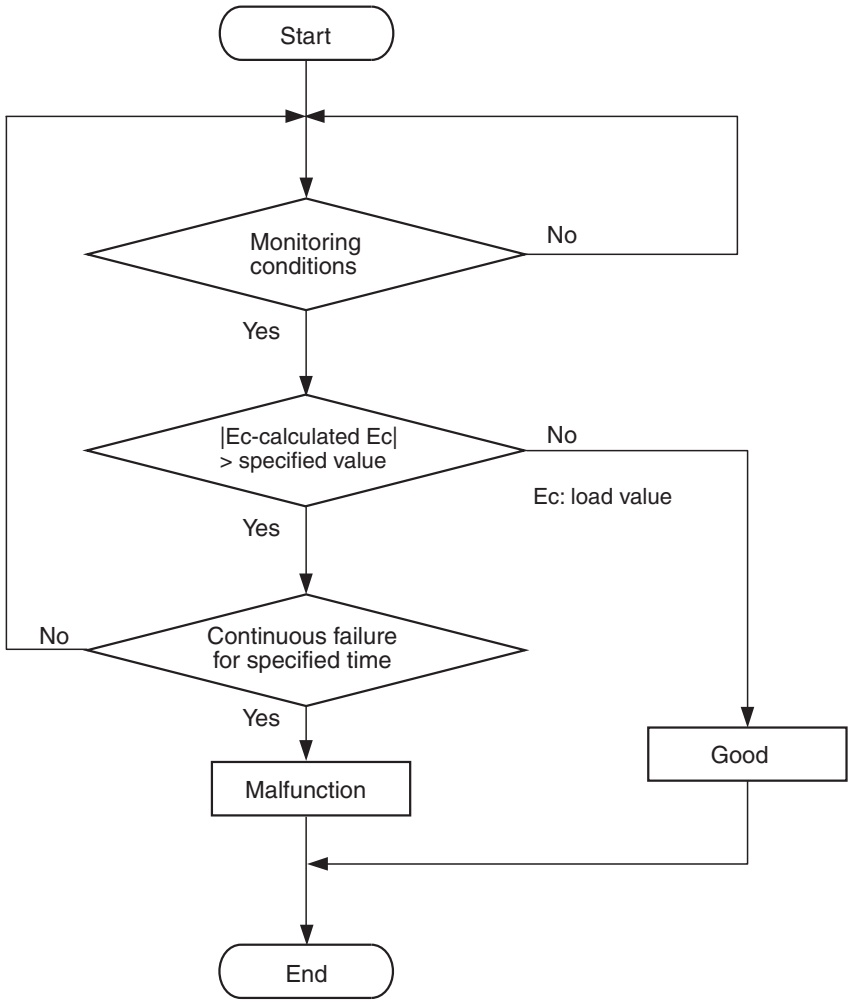
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 0 percent or more. Or, the volumetric efficiency is 60 percent or less.
- The engine speed is between 750 and 3,000 r/min. Or, the throttle position sensor (main) output voltage is 3 volts or more.

TSB Revision

Judgment Criterion

- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (main) throttle position sensor is 33 percent or more.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor (main) system failed.
- Intake system vacuum leak.
- ECM failed.

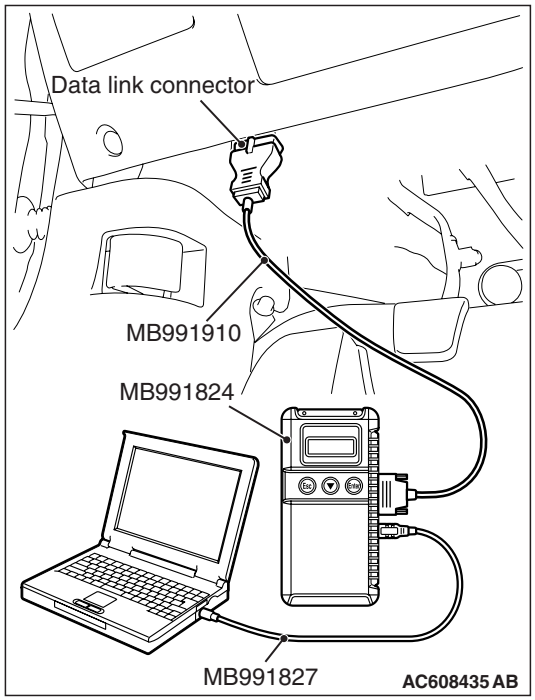
OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1233 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 13: Throttle Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 13, Throttle Position Sensor (main).
- Output voltage should be between 0.3 and 0.7 volt when the throttle valve is fully closed with your finger.
- Output voltage should be 4.0 volts or more when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1233 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1233 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

TSB Revision

DTC P1234: Throttle Position Sensor (Sub) Plausibility

TECHNICAL DESCRIPTION

Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (sub) signal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

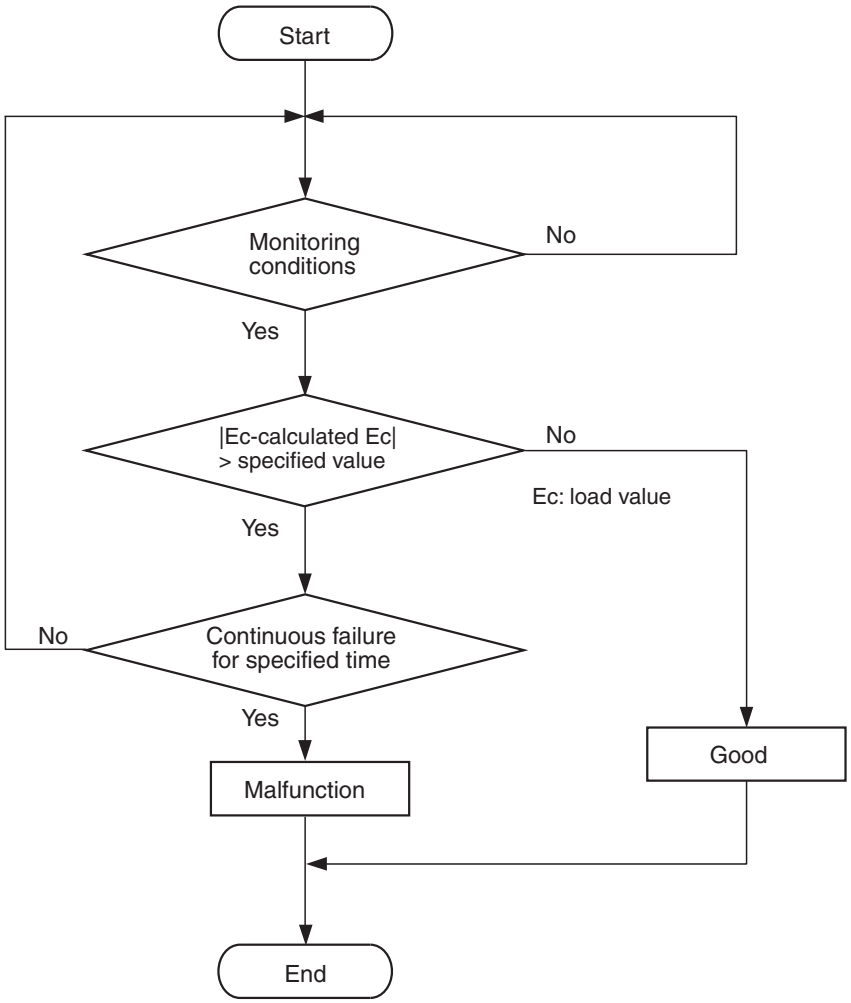
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the (sub) throttle position sensor is 0 percent or more. Or, the volumetric efficiency is 60 percent or less.
- The engine speed is between 750 and 3,000 r/min. Or, the throttle position sensor (main) output voltage is 3 volts or more.

Judgment Criterion

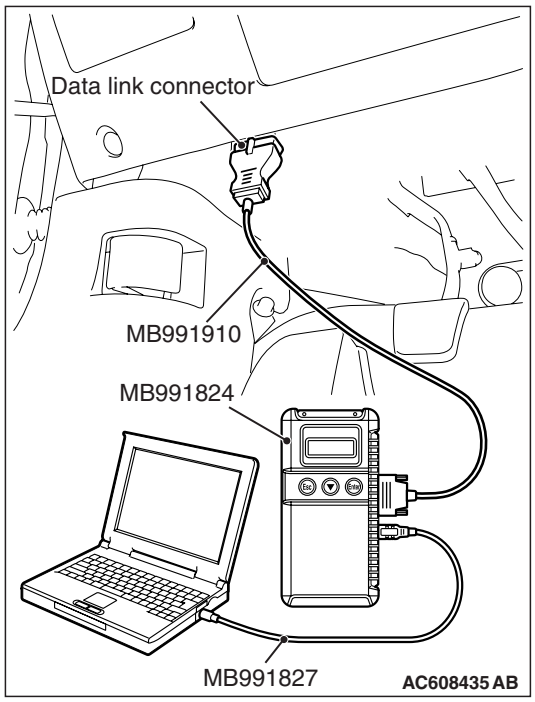
- For 0.4 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (sub) is 33 percent or more.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor (sub) system failed.
- Intake system vacuum leak.
- ECM failed.



DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1234 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list item 15: Throttle Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Detach the intake air hose at the throttle body.
(3) Disconnect the connector of the throttle position sensor.
(4) Use test harness special tool (MB991658) to connect only terminals No. 3, No. 4, No. 5, and No. 6.
(5) Set scan tool MB991958 to the data reading mode for item 15, Throttle Position Sensor (sub).
- Output voltage should be 4.0 volts or more when the throttle valve is fully closed with your finger.
- Output voltage should be 1.0 volt or less when the throttle valve is fully open with your finger.

(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 3.

STEP 3. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 5.
NO : Go to Step 4.

STEP 4. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1234 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. The go to Step 5.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1234 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

TSB Revision

DTC P1235: Mass Airflow Sensor Plausibility

TECHNICAL DESCRIPTION

Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main or sub) signal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

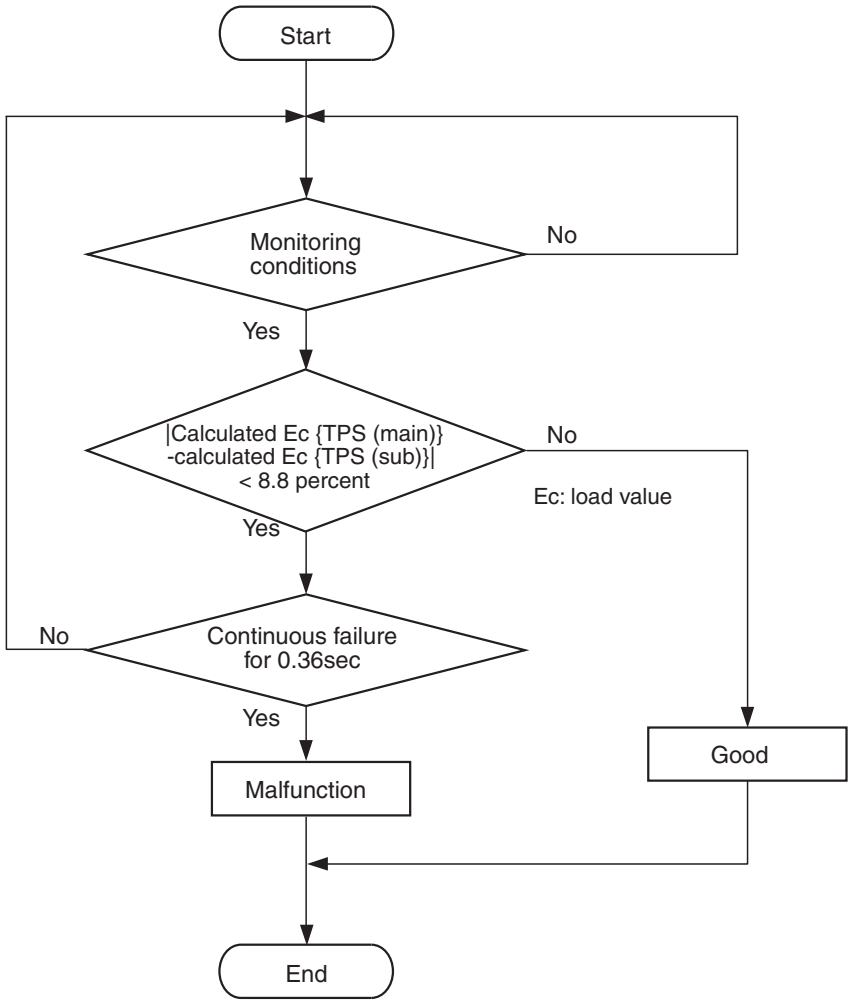
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- The plausibility error of the throttle position sensor (main) is detected.
- The plausibility error of the throttle position sensor (sub) is detected.

Judgment Criterion

- For 0.36 second, the difference between the volumetric efficiency estimated by the throttle position sensor (main) and the volumetric efficiency estimated by the throttle position sensor (sub) is 8.8 percent or less.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor system failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

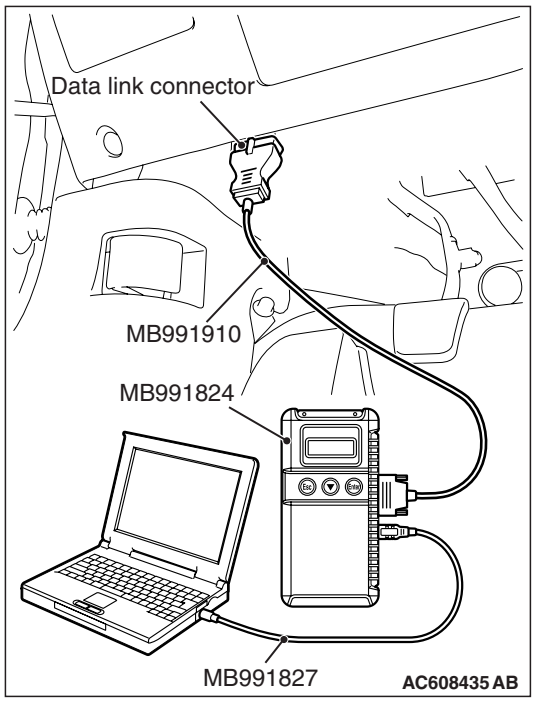
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1235 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
  - The standard value during idling should be between 1,350 and 1,670 millivolts.
  - When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13A-131, DTC P0102 –Mass Airflow Circuit Low Input P.13A-137, DTC P0103 –Mass Airflow Circuit High Input P.13A-144.

TSB Revision

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1235 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1235 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1236: A/D Converter

TECHNICAL DESCRIPTION

Monitors whether input voltage from the accelerator pedal position sensor (sub) is normally converted into a digital signal in the ECM.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- When the input voltage from the accelerator pedal position sensor (sub) is periodically 0 V for 0.45 second, the digital value of the input voltage indicates 0.2 V or more.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

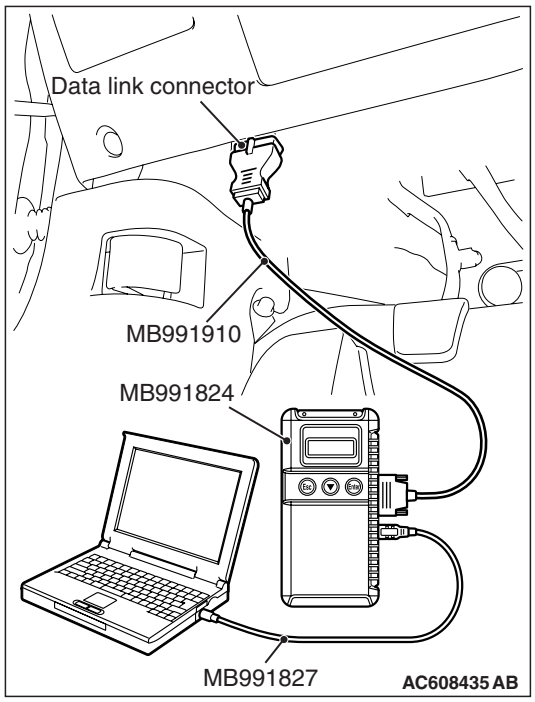
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1236 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



DTC P1237: Accelerator Pedal Position Sensor Plausibility

TECHNICAL DESCRIPTION

Compare the output value of the accelerator pedal position sensor (main) with that of the accelerator pedal position sensor (sub).

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

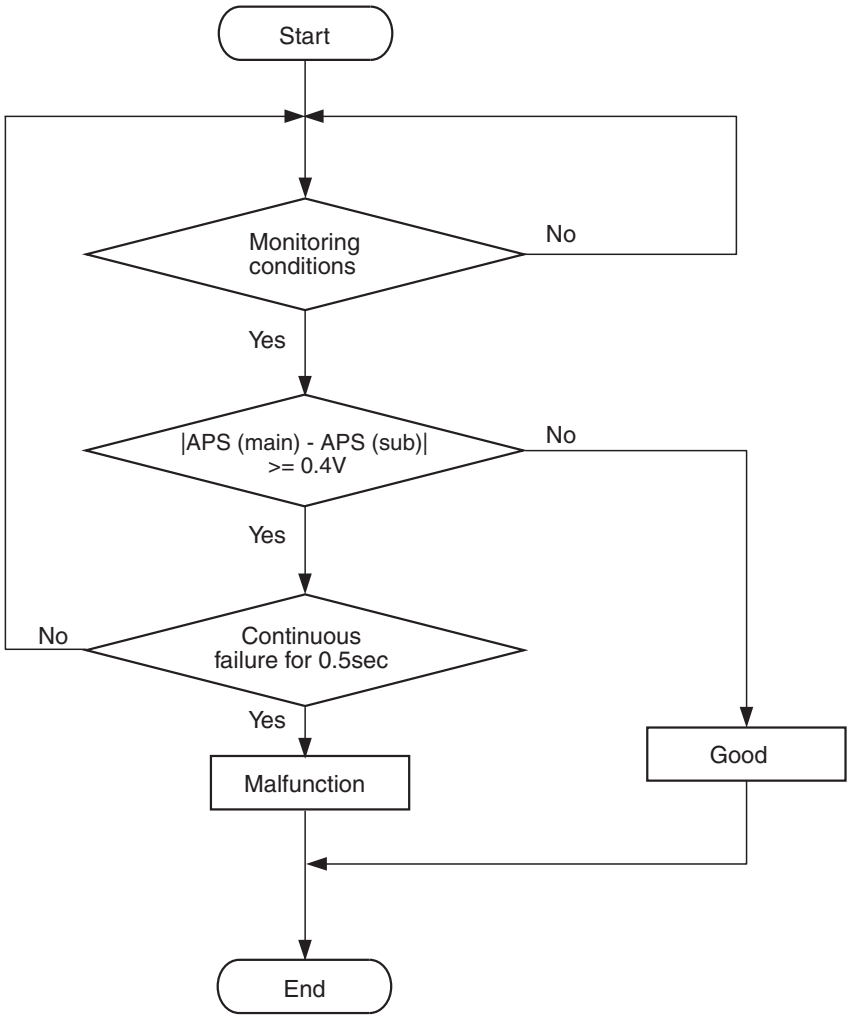
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Change of accelerator pedal position sensor (sub) output voltage per 40 milliseconds is lower than 0.06 volt.

Judgment Criterion

- Voltage obtained with the formula given below is 0.4 volt or higher for 0.5 second: accelerator pedal position sensor (main) output voltage – accelerator pedal position sensor (sub) output voltage.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

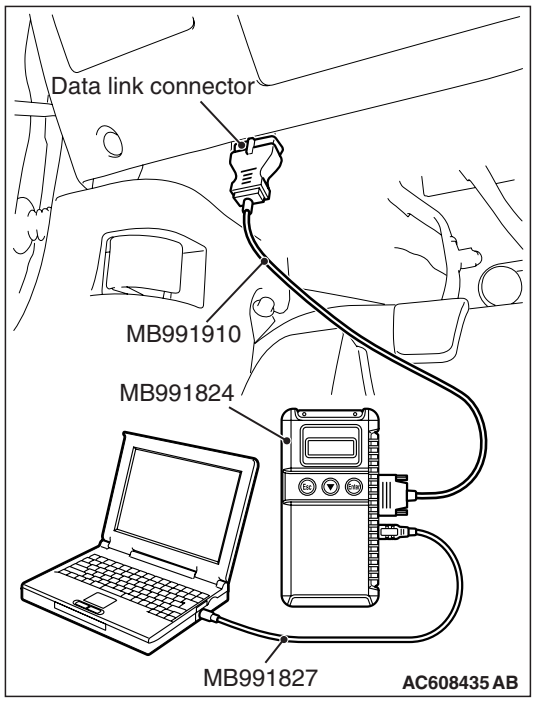
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1237 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 11: Accelerator pedal position sensor (main)
   b. Item 12: Accelerator pedal position sensor (sub)
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 4.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1237 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1237 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1238: Mass Airflow Sensor Plausibility (Torque Monitor)

TECHNICAL DESCRIPTION

Compare the actual measurement of volumetric efficiency by a mass airflow sensor signal with volumetric efficiency estimated from a throttle position sensor (main or sub) signal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

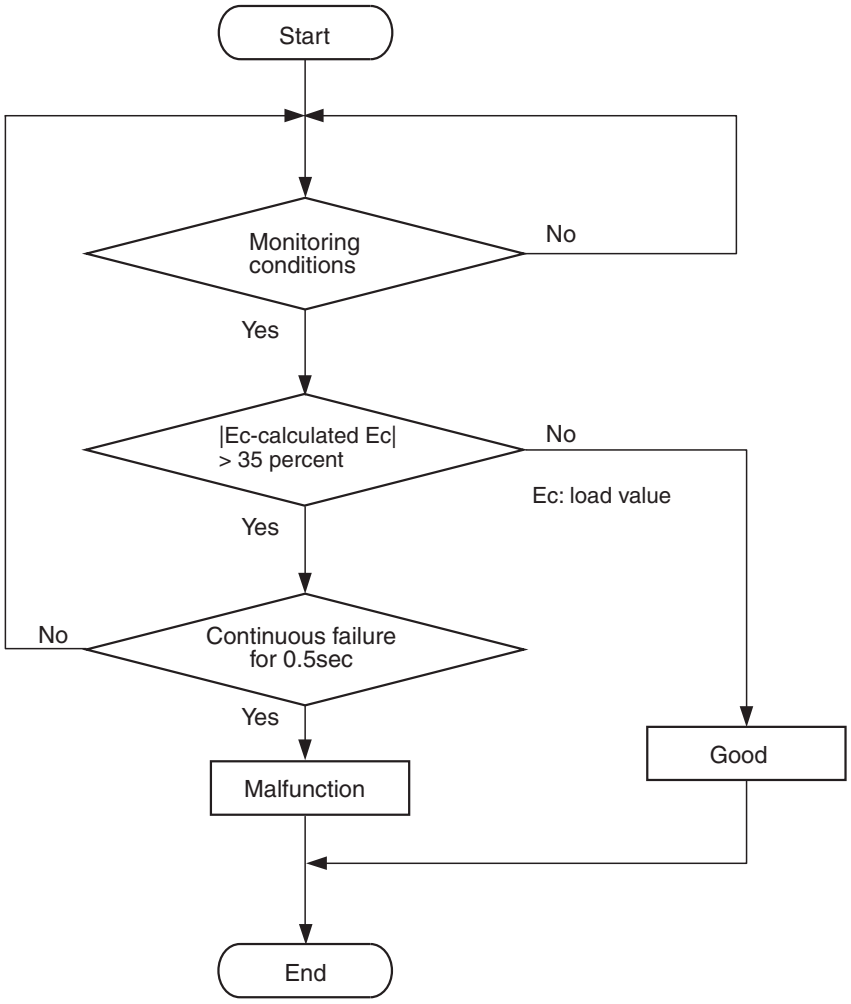
Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS



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Check Conditions

- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (main) is 0 percent or more. Or, the volumetric efficiency is 60 percent or less.
- Engine speed is 750 r/min or higher.

Judgment Criterion

- For 0.5 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (main) is 35 percent or more.

Check Condition

- The difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (sub) is 0 percent or more. Or, the volumetric efficiency is 60 percent or less.
- Engine speed is 750 r/min or higher.

Judgment Criterion

- For 0.5 second, the difference between the actual volumetric efficiency and the volumetric efficiency estimated by the throttle position sensor (sub) is 35 percent or more.

TSB Revision

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Mass airflow sensor system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

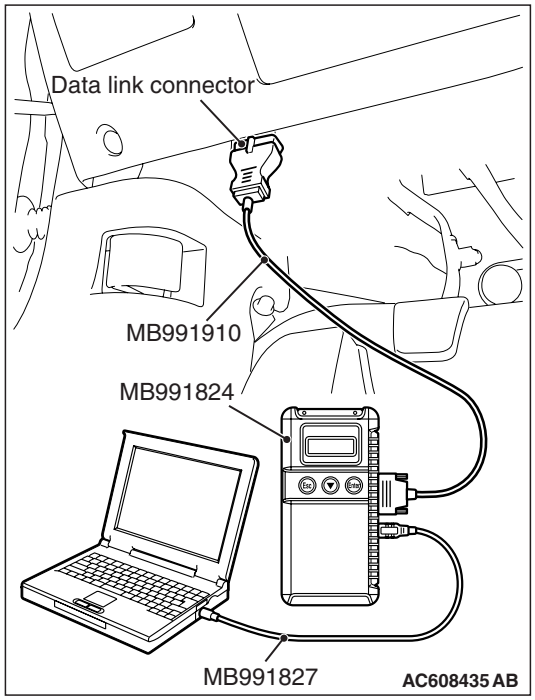
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1238 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list item 10: Mass Airflow Sensor.

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item 10, Mass Airflow Sensor.
(3) Warm up the engine to normal operating temperature: 80° C to 95° C (176° F to 203° F).
- The standard value during idling should be between 1,350 and 1,670 millivolts.
- When the engine is revved, the mass airflow rate should increase according to the increase in engine speed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 3.
NO : Refer to, DTC P0101 –Mass Airflow Circuit Range/Performance Problem P.13A-131, DTC P0102 –Mass Airflow Circuit Low Input P.13A-137, DTC P0103 –Mass Airflow Circuit High Input P.13A-144.

STEP 3. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1238 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1238 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1239: Engine RPM Plausibility

TECHNICAL DESCRIPTION

Compares the actual engine speed calculated from the crankshaft position sensor signal cycle with the estimated engine speed calculated from the number of the crankshaft position sensor signal pulses after a lapse of the specified time.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

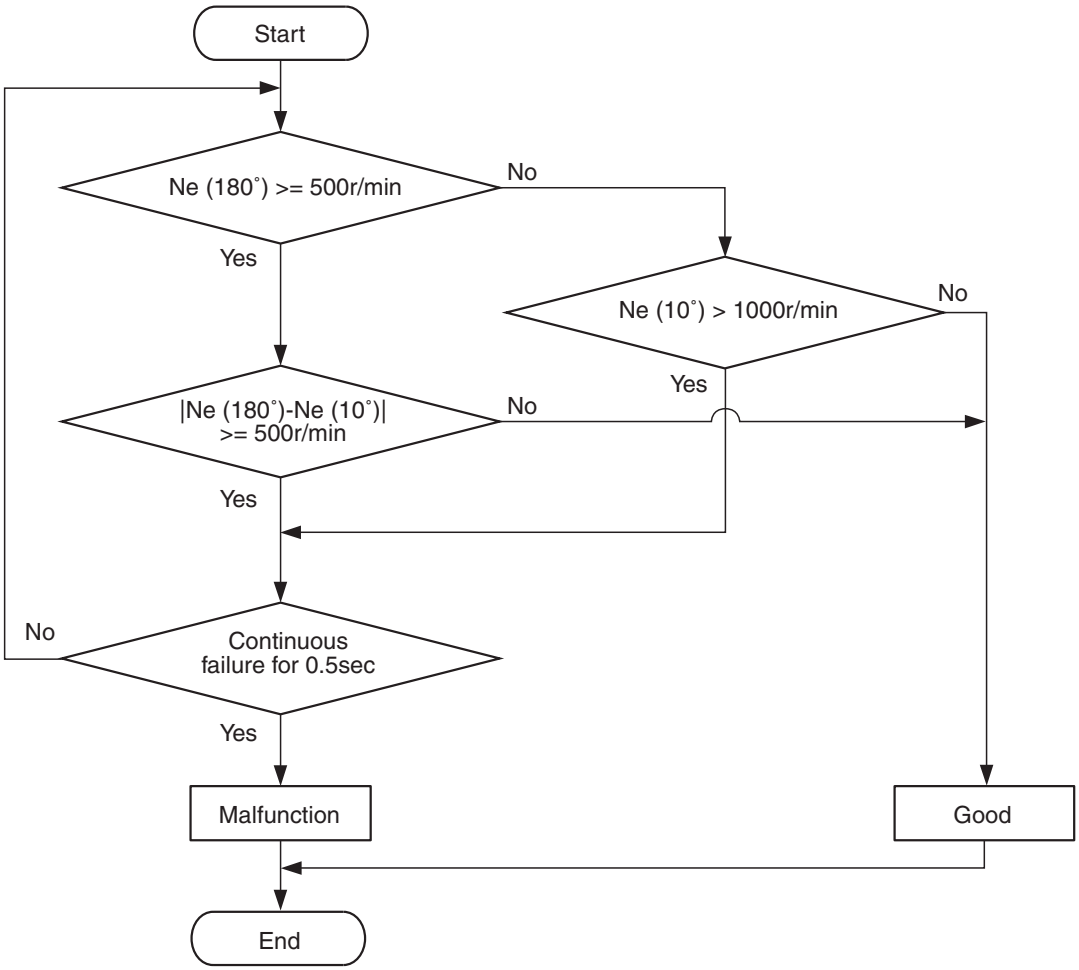
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- The engine speed monitored with a 180 degree-cycle pulse is 500 r/min or more.

TSB Revision

Judgment Criterion
- The difference between the engine speed monitored with a 180 degree-cycle pulse and the engine speed monitored with a 10 degree-cycle pulse is 500 r/min or more.

Check Condition
- The engine speed monitored with a 180 degree-cycle pulse is 500 r/min or less.

Judgment Criterion
- The engine speed monitored with a 10 degree-cycle pulse is 1,000 r/min or more.

OBD-II DRIVE CYCLE PATTERN

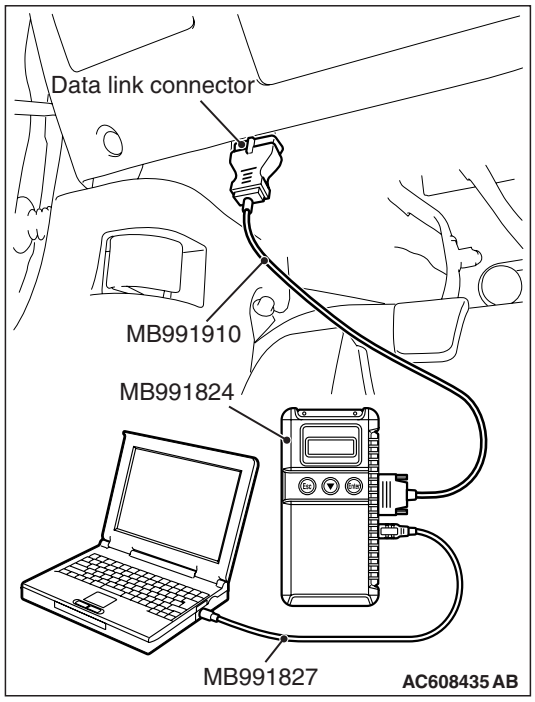
Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 23 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Crankshaft position sensor system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1239 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1239 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.
(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 23 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1239 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1240: Ignition Angle

TECHNICAL DESCRIPTION

Checks for an abnormal ignition timing retard angle demand signal from the active stability control (ASC).

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- The ignition timing retard angle demand signal is not normal.

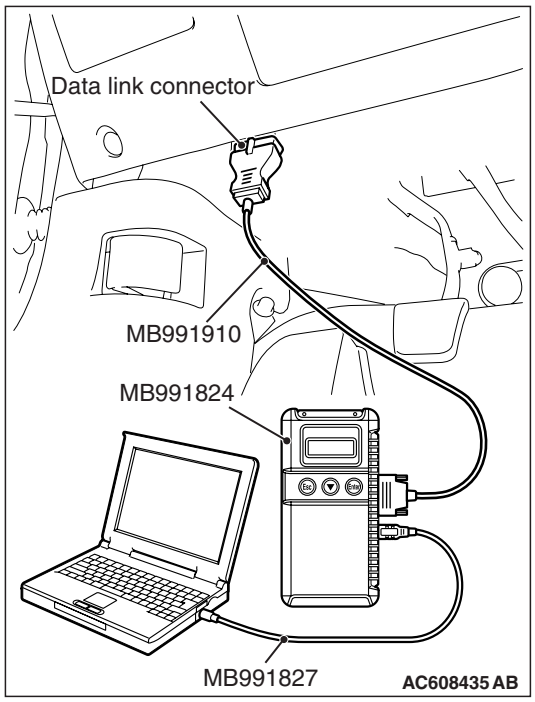
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

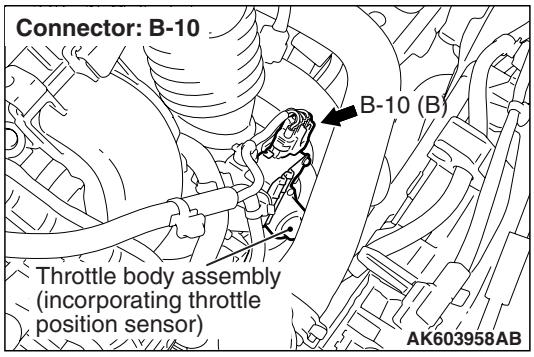
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

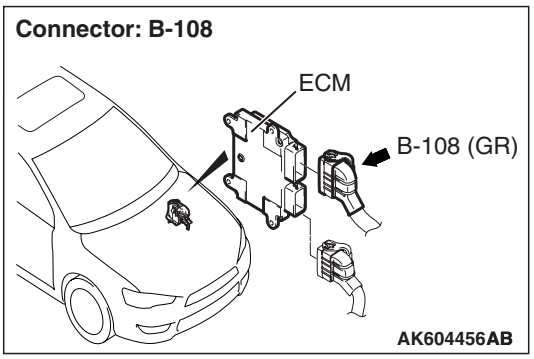
Q: Is the ABS-DTC or ASC-DTC set?

YES : Refer to GROUP 35B, Anti-lock Braking System – Diagnostic Trouble Code Chart P.35B-8.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

DTC P1241: Torque Monitoring





TECHNICAL DESCRIPTION

Compares the actual torque signal computed from a mass air flow sensor signal with the driver demand torque signal computed from an accelerator pedal position sensor signal.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

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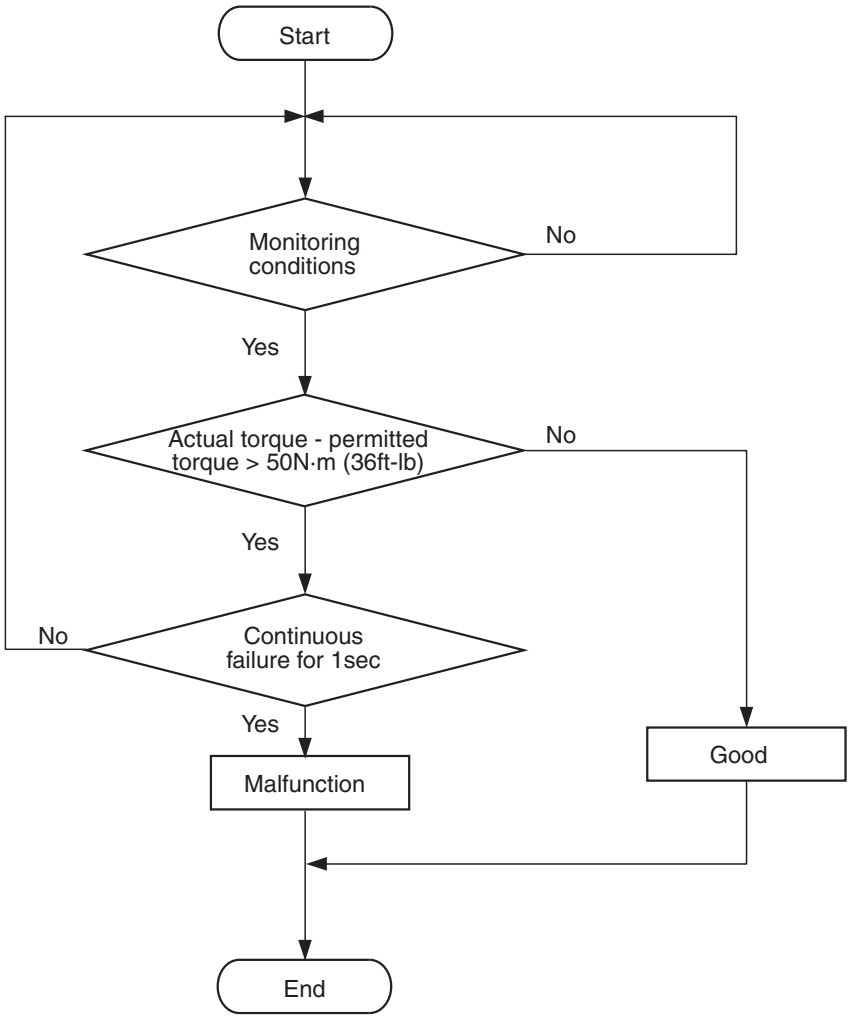
DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Engine speed is 500 r/min or higher.
- Volumetric efficiency is 16 percent or higher.

Judgement Criterion

- For 1 second, the difference between the actual torque signal and the requested torque signal is 50 N· m (37 ft-lb).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed.
- Connector damage.
- Harness damage.
- Vacuum leak.
- ECM failed

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 17 P.13A-10.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

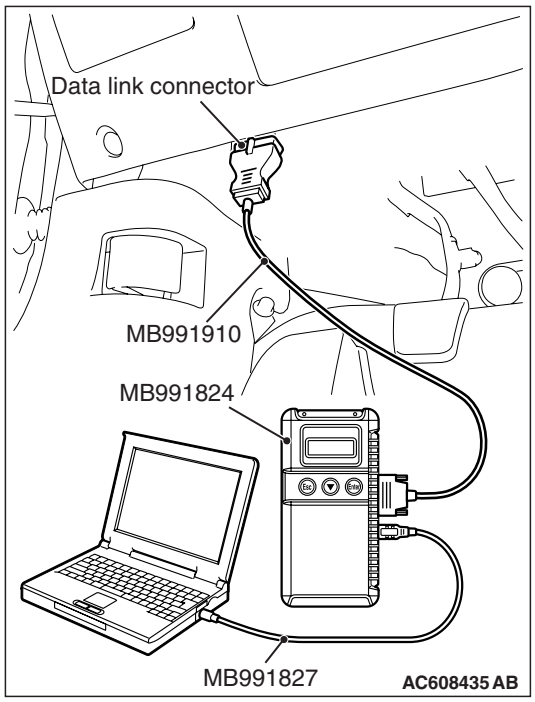
STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1241 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 10: Mass Airflow Sensor.
   b. Item 11: Accelerator Pedal Position Sensor (main).
   c. Item 12: Accelerator Pedal Position Sensor (sub).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 3.
NO : Repair or replace it. Then go to Step 9.

STEP 3. Check harness connector B-10 at throttle actuator control motor and harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

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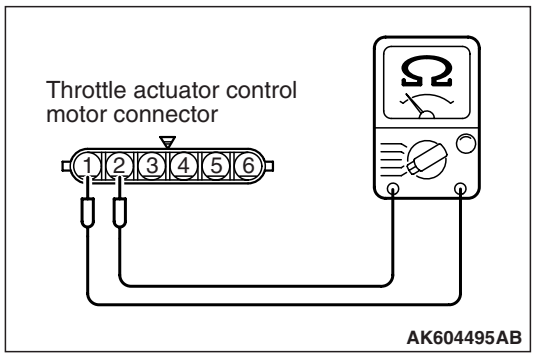


STEP 4. Check the throttle actuator control motor.

(1) Disconnect the connector B-10.
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 –80 ohms [at 20° C (68° C)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20° C (68° C)?

YES : Go to Step 5.
NO : Replace the throttle body assembly. Then go Step 9.

STEP 5. Check for harness damage between throttle actuator control motor connector B-10 (terminal No. 1) and PCM connector B-108 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 9.

STEP 6. Check for harness damage between throttle actuator control motor connector B-10 (terminal No. 2) and PCM connector B-108 (terminal No. 16).

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 9.

STEP 7. Check for intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair it. Then go to Step 9.
NO : Go to Step 8.

STEP 8. Check the trouble symptoms.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1241 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

TSB Revision

STEP 9. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle Pattern 17 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1241 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1242: Fail Safe Control Monitor

TECHNICAL DESCRIPTION

Monitors the engine speed during fail-safe control.

DTC SET CONDITIONS

Check Condition

- During fail safe control.

Judgment Criterion

- The engine speed is higher than assumed.

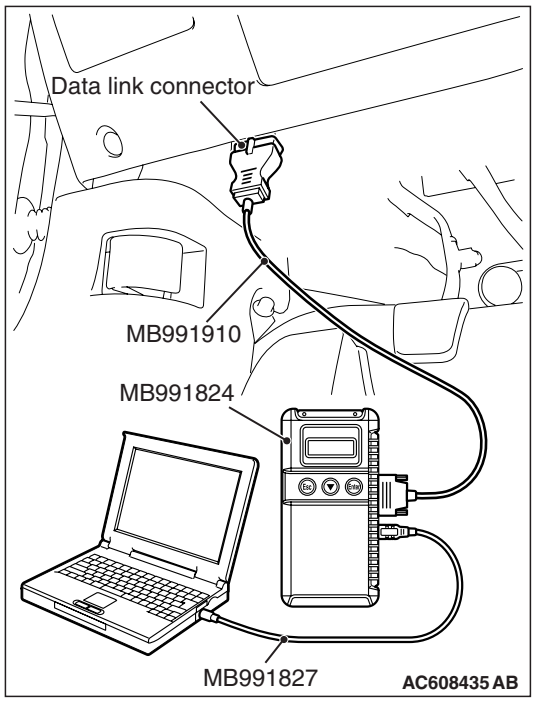
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1242 set?

YES : Refer to, Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2 .

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1242 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1243: Inquiry/Response Error

TECHNICAL DESCRIPTION
Monitors the computation function of the ECM.

DTC SET CONDITIONS

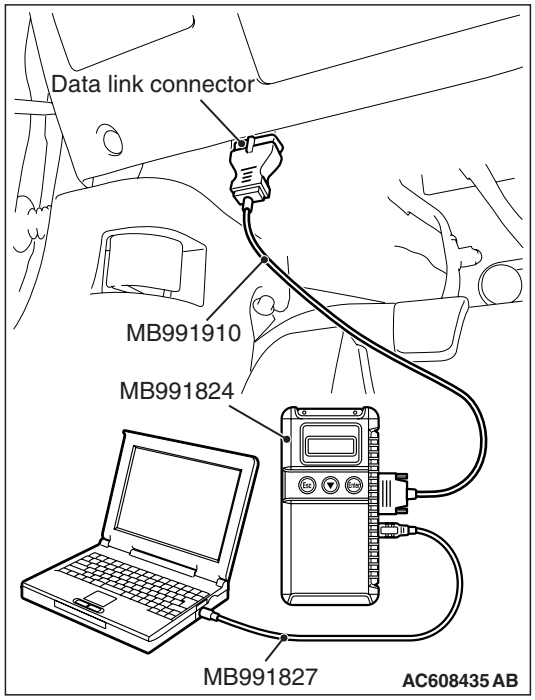
Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- ECM can not calculate input data.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1243 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1244: RAM Test For All Area

TECHNICAL DESCRIPTION

Monitors the computation function of the ECM periodically.

DTC SET CONDITIONS

Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- All RAM data of ECM are defect.

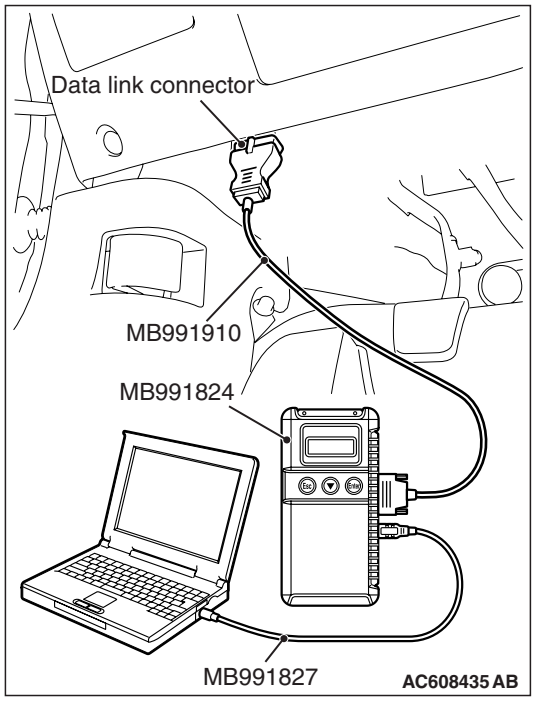
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1244 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1245: Cycle RAM Test (Engine)

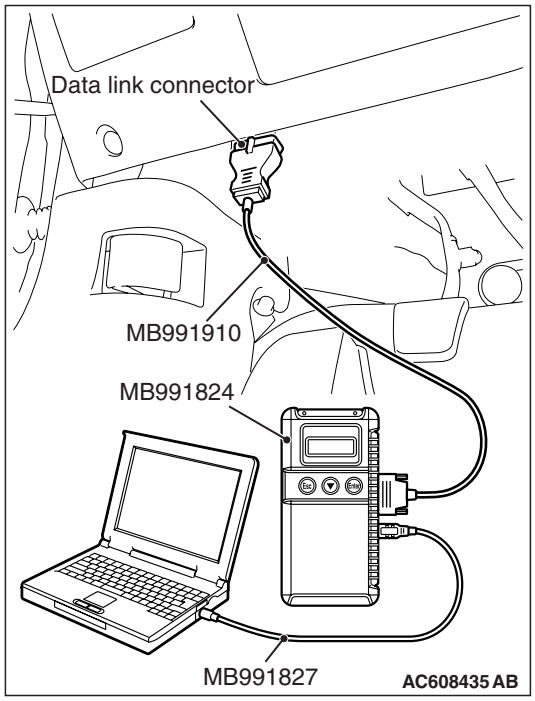
TECHNICAL DESCRIPTION
Monitors the computation function of the ECM periodically.

DTC SET CONDITIONS
Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- RAM data (engine) is defect.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM failed.

DIAGNOSIS
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1245 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1247: CVT Plausibility <CVT>

TECHNICAL DESCRIPTION
Checks for an abnormal signal of TCM.

DTC SET CONDITIONS

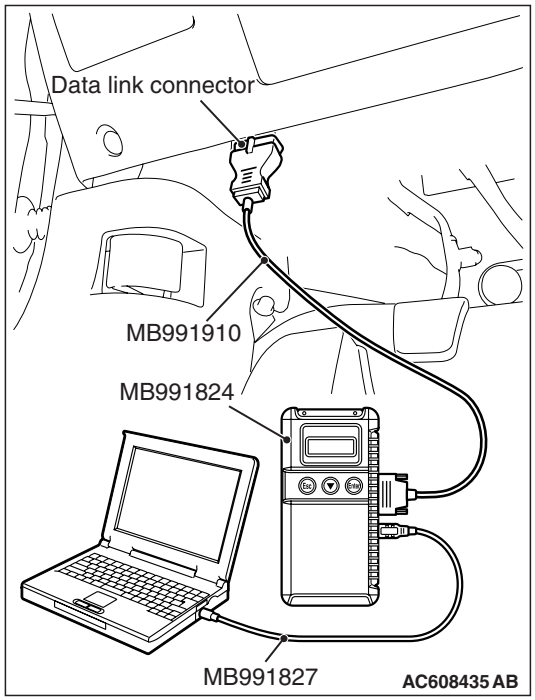
Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- A torque demand signal from TCM is not normal.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- CVT system failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the CVT-DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CVT-DTC set?

YES : Refer to GROUP 23A, CVT –Diagnostic Trouble Code Chart P.23A-29.
NO : Go to Step 2 .

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1247 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1320: Ignition Timing Retard Insufficient

TECHNICAL DESCRIPTION

- After starting the engine in the cold state, the ECM retards the ignition timing to early activate the catalyst by letting out the high temperature exhaust gases.
- The ECM monitors whether the retard ignition timing control is normal or not.

DESCRIPTIONS OF MONITOR METHODS

After starting the engine in the cold state, the retard ignition timing control is abnormal, which is caused by a decrease in idle speed and so on.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

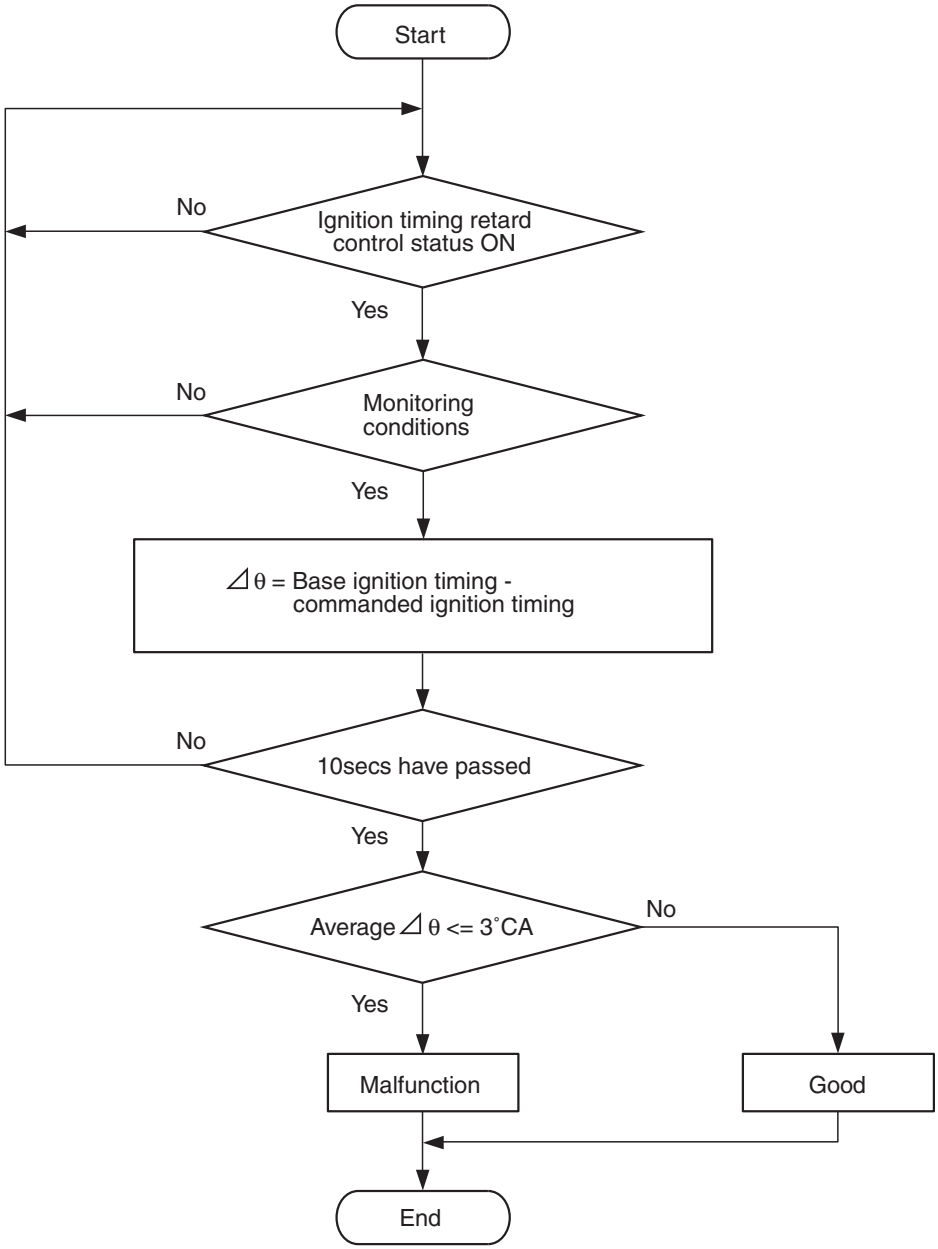
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Under the ignition timing retard control.
- Engine coolant temperature is between 7° C (45° F) and 41° C (106° F).

Judgement Criteria

- For 10 seconds, the difference between the basic ignition timing and the target/specified ignition timing is 3° CA or less on average during the retard control.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 19 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- The thermostat is faulty.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

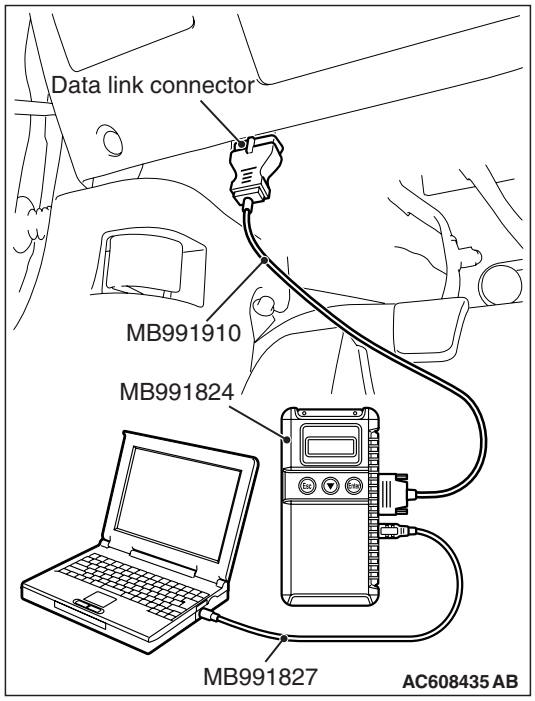
YES : Perform cleaning. Refer to Throttle body (throttle valve area) cleaning P.13A-929. Then go to Step 3.

NO : Repair it. Then go to Step 2.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1320 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 19 P.13A-10.
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1320 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

TSB Revision

DTC P1506: Idle Control System RPM Lower Than Expected at Low Temperature

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

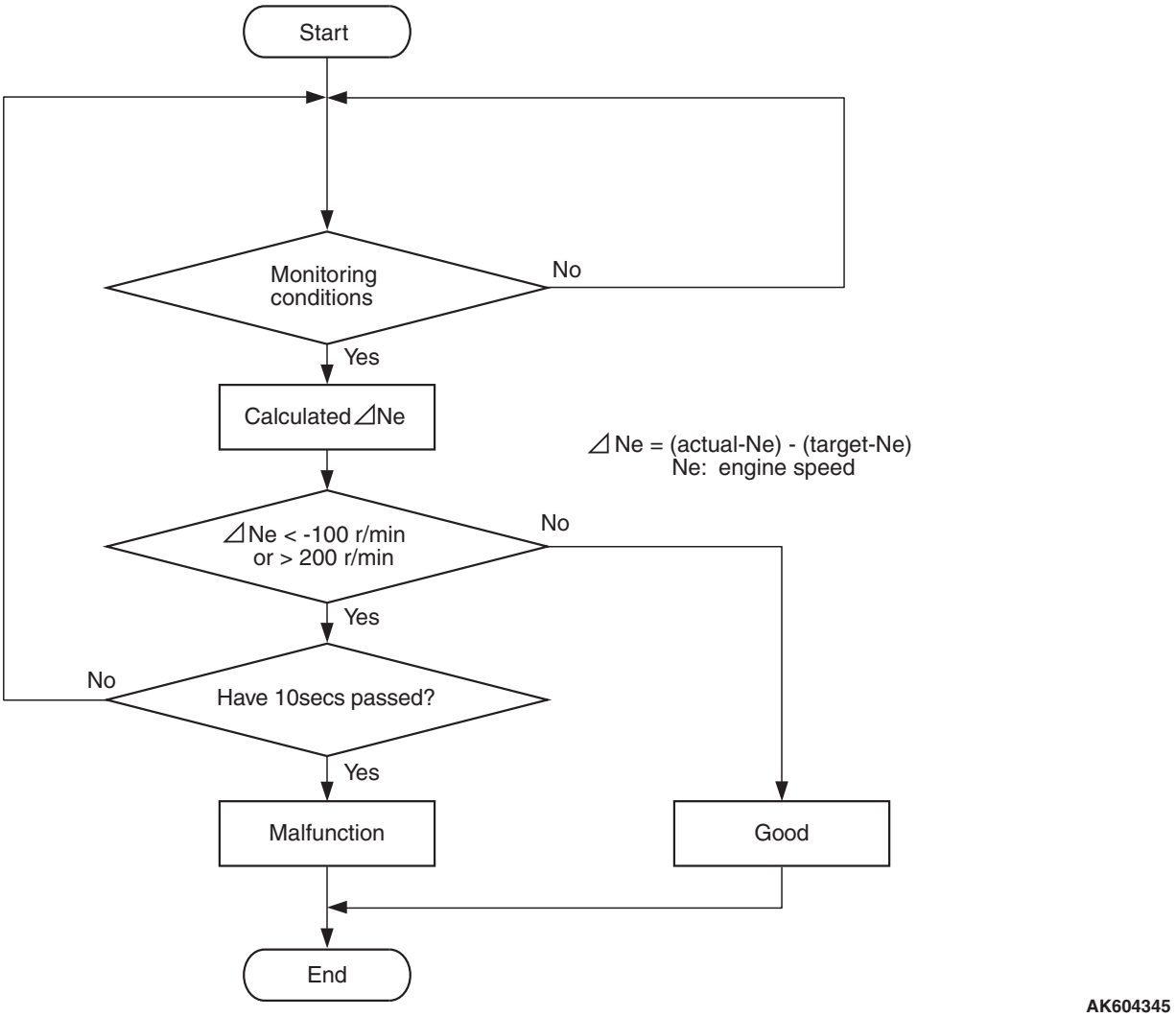
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor <California>
- Fuel system monitor
- Vehicle speed sensor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions

- Under the closed loop idle speed control.
- The engine coolant temperature is between 7° C (45° F) and 41° C (106° F).
- Battery positive voltage is higher than 10 volts.
- Power steering pressure switch: OFF.
- Volumetric efficiency is lower than 70 percent.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- More than 3 seconds have elapsed from the previous monitoring.
- Target air flow rate is more than 23 L/sec.

Judgment Criterion

- The actual idle speed is more than 100 r/min lower than the target idle speed for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 18 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle valve area is dirty.
- Throttle body assembly failed.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

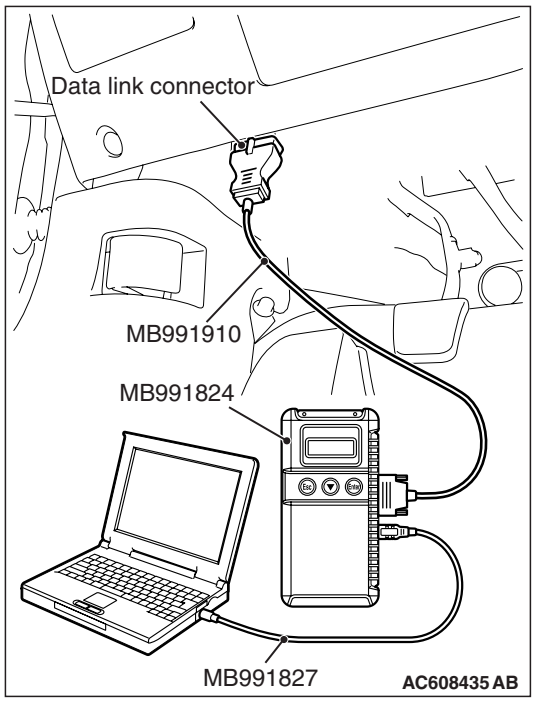
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1506 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check the throttle body. (throttle valve area)

Q: Is the throttle valve area dirty?

YES : Perform cleaning. Refer to Throttle body (throttle valve area) cleaning P.13A-929. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Carry out test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P1506 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : The inspection is complete.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1506 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1507: Idle Control System RPM Higher Than Expected at Low Temperature

TECHNICAL DESCRIPTION

- The amount of air taken in during idling is regulated by the opening and closing of the throttle valve.
- The ECM checks the difference between the actual engine speed and the target engine speed.

DESCRIPTIONS OF MONITOR METHODS

Difference between actual and target idle speed is over the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

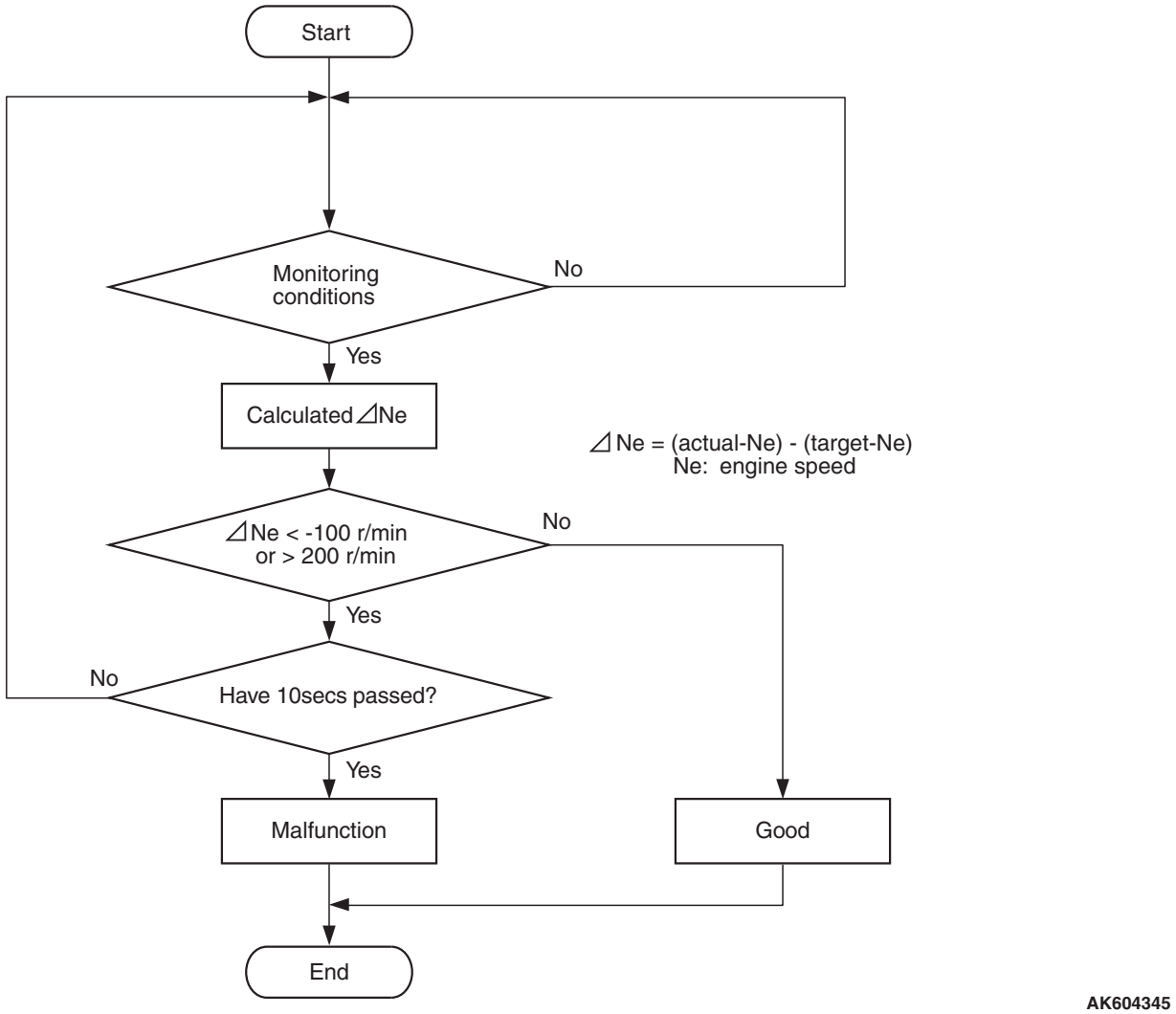
- Misfire monitor
- Exhaust gas recirculation (EGR) system monitor <California>
- Fuel system monitor
- Vehicle speed sensor monitor

Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor

DTC SET CONDITIONS

Logic Flow Chart



Check Conditions

- Under the closed loop idle speed control.
- Engine coolant temperature is between 7° C (45° F) and 41° C (106° F).
- Battery positive voltage is higher than 10 volts.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than –10° C (14° F).
- More than 3 seconds have elapsed from the previous monitoring.
- Target air flow rate is 0 L/sec.

Judgement Criterion

- Actual idle speed has continued to be higher than the target idle speed by 200 r/min (300 r/min*) or more for 10 seconds.

*: Specs in parentheses are applicable if the maximum air temperature during the previous operation was more than 45° C (113° F).

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 18 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Intake system vacuum leak.
- ECM failed.
- Throttle body assembly failed.

TSB Revision

DIAGNOSIS

Required Special Tools

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

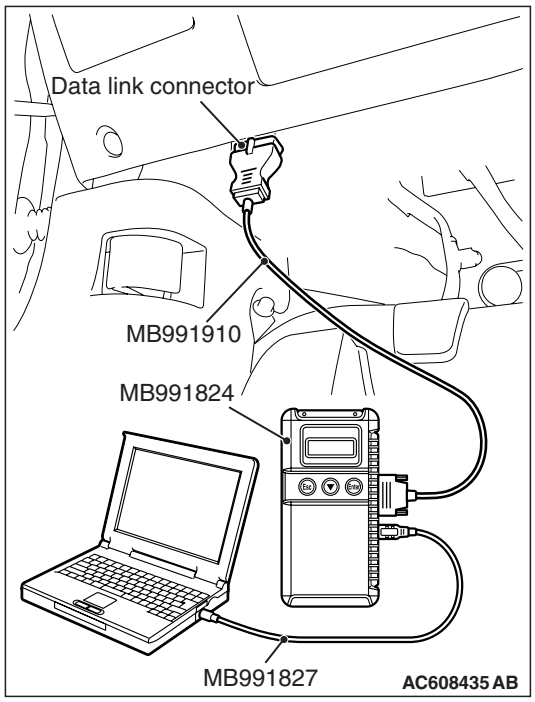
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the diagnostic trouble code other than P1507 set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check the intake system vacuum leak.

Q: Are there any abnormalities?

YES : Repair or replace it. Then go to Step 4.
NO : Go to Step 3.

STEP 3. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P1507 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : The inspection is complete.

TSB Revision

STEP 4. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 18 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P1507 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P1590: TCM to ECM Communication Error in Torque Reduction Request

TECHNICAL DESCRIPTIONS OF MONITOR METHODS

The ECM checks whether the errors in data communications sent by the TCM exist or not.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

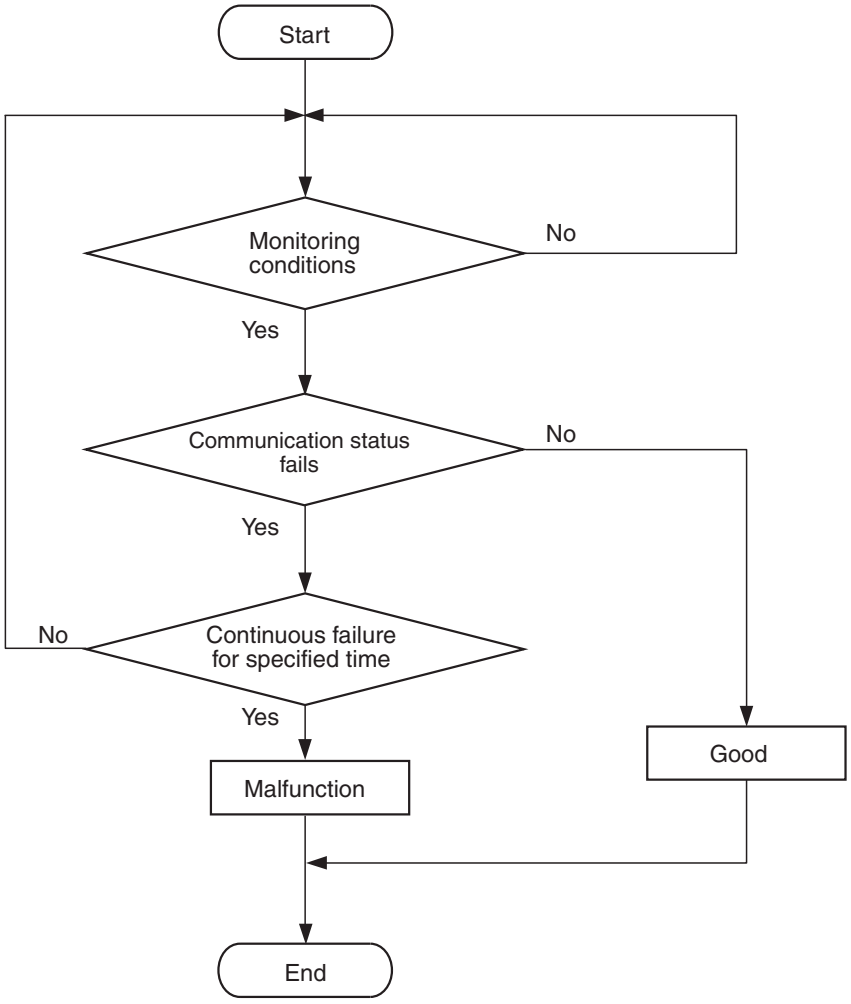
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgment Criterion

- ECM detects an error in communication between ECM and TCM.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, diagnose CAN bus line.

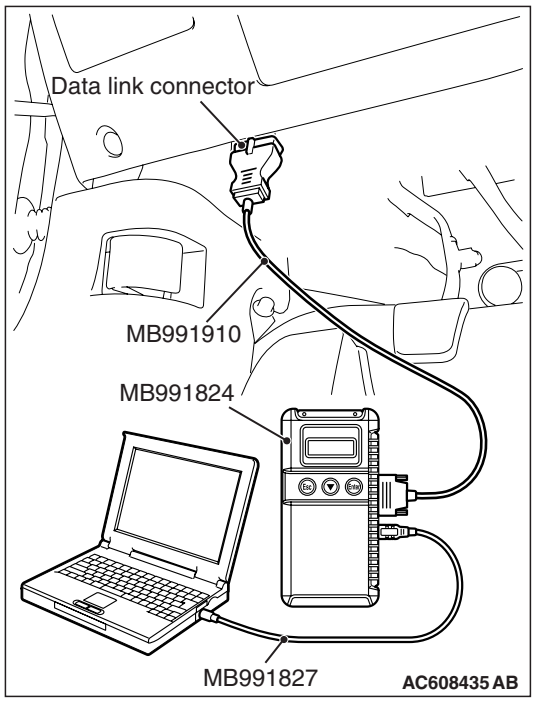
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2 .
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

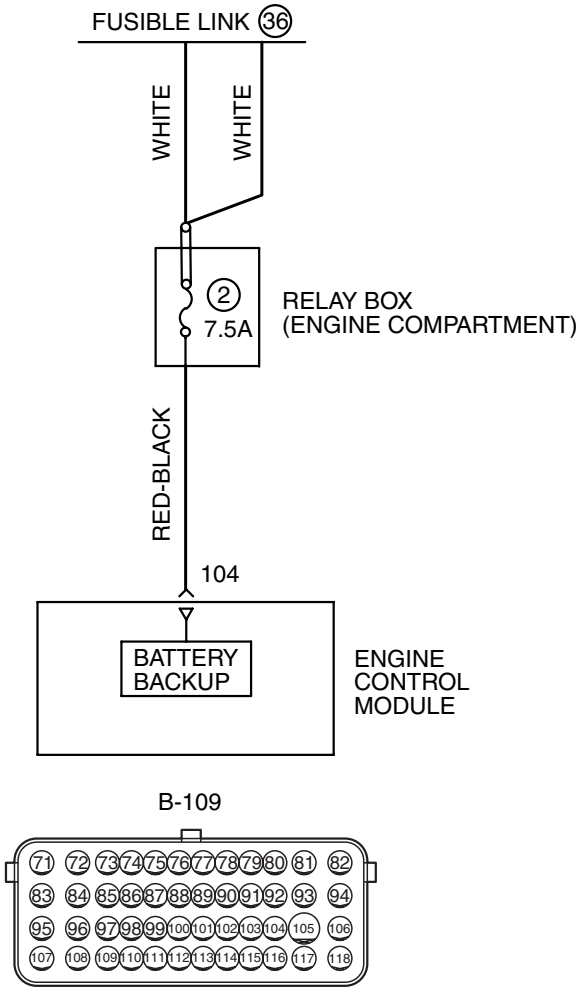
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1590 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P1603: Battery Backup Line Malfunction

BATTERY BACKUP CIRCUIT



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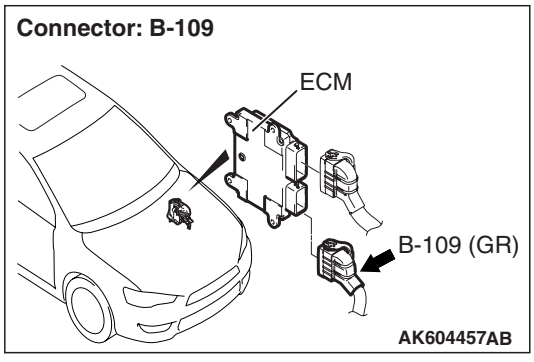


TECHNICAL DESCRIPTION

- The ECM checks the open circuit of battery backup line.

NOTE: When the system detects an open circuit in the battery backup line, it makes 1 failure judgment of other diagnostic trouble codes (DTCs).

DESCRIPTIONS OF MONITOR METHODS

Battery backup line voltage is under specified value.

TSB Revision

MONITOR EXECUTION
Continuous

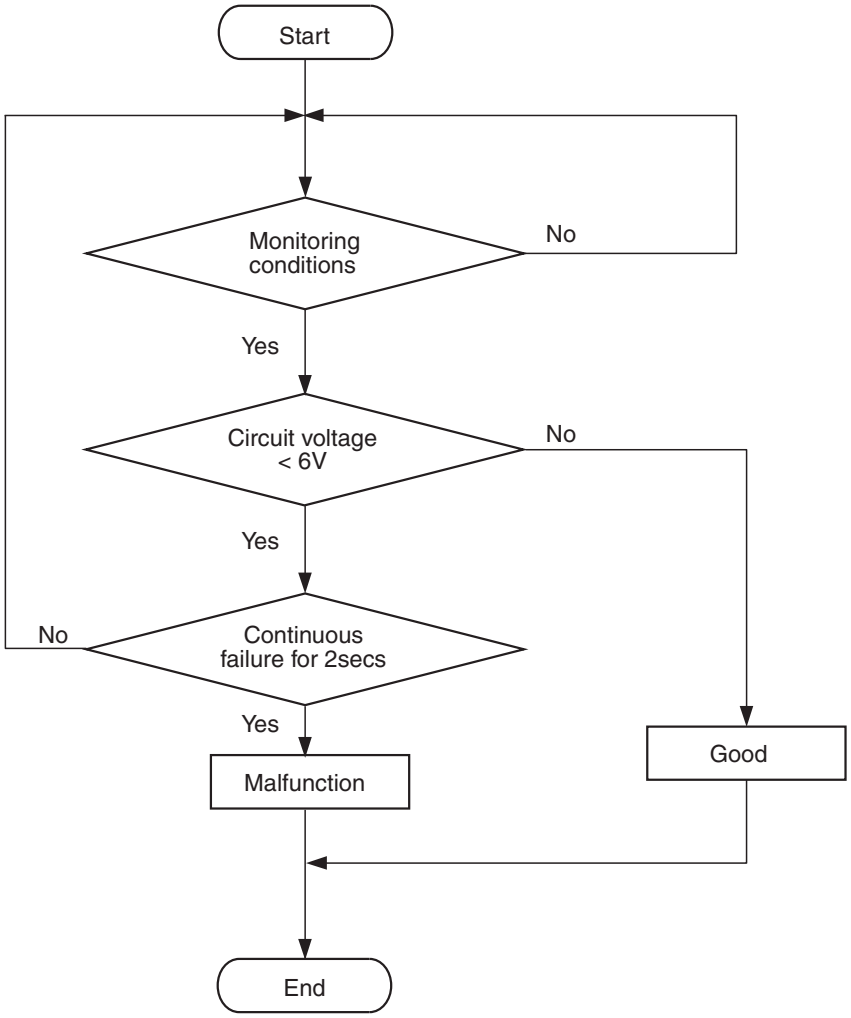
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Conditions
- Engine starting sequence was completed.
- Battery positive voltage is higher than 10 volts.

TSB Revision

Judgement Criterion

- Battery backup line voltage has continued to be 6 volts or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

None.

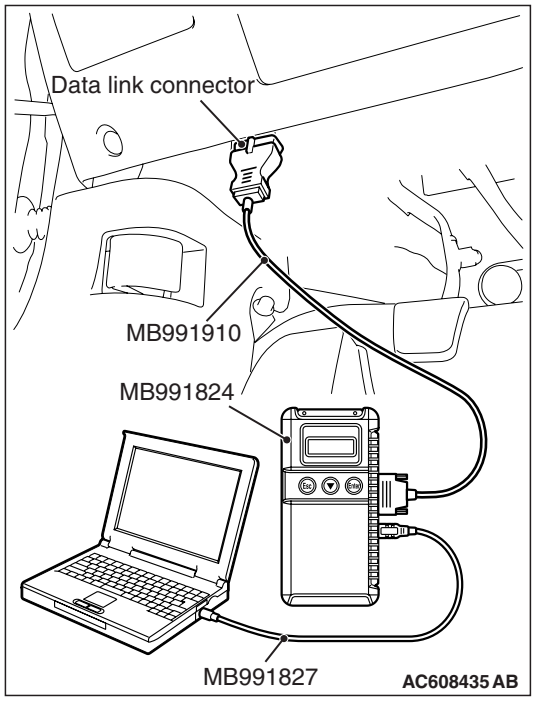
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Open or shorted battery backup line, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB992110: Power Plant ECU Check Harness



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Start the engine and run it at idle.
(5) Read the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1603 set?

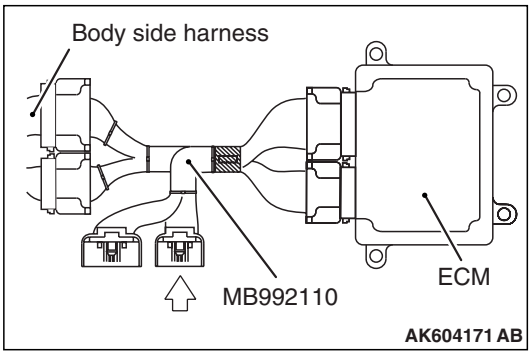
YES : Go to Step 2.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 2. Check harness connector B-109 at ECM for damage.

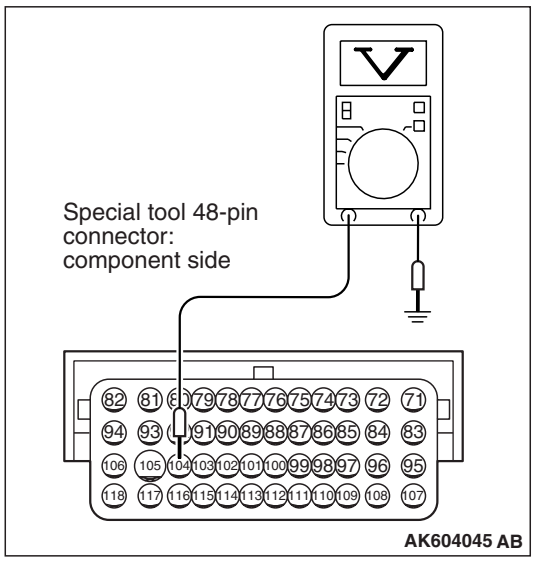
Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 3. Measure the backup power supply voltage at ECM connector B-109 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



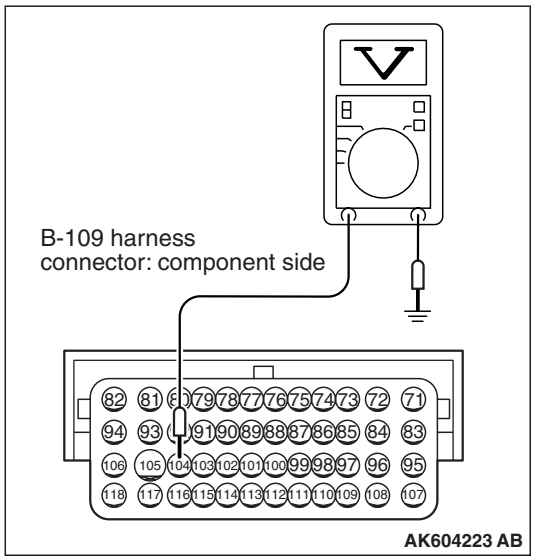
(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 5.

NO : Go to Step 4.

STEP 4. Measure the backup power supply voltage at ECM harness side connector B-109.



(1) Disconnect the ECM connector B-109 and measure at the harness side.

(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Repair harness wire between battery and ECM connector B-109 (terminal No. 104) because of harness damage. Then go to Step 5.

NO : Repair harness wire between battery and ECM connector B-109 (terminal No. 104) because of open circuit or short circuit to ground. Then go to Step 5.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P1603 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P1676: Variant Coding

TECHNICAL DESCRIPTION

- The ECM performs proper engine control based on vehicle information entered.
- A vehicle identification number (VIN) is entered at a plant before shipment. This diagnosis code occurs when no vehicle information is entered during ECM replacement.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

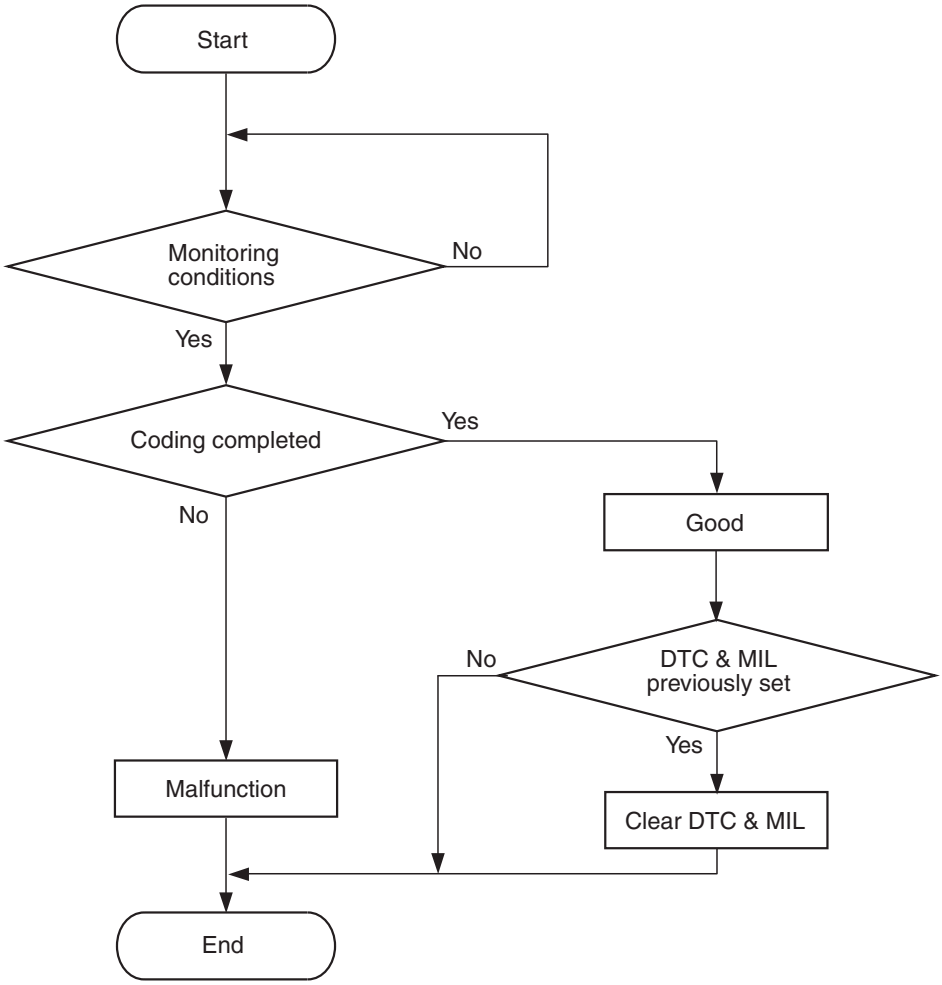
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition
- Ignition switch is "ON" position.

Judgment Criterion
- Vehicle information is not entered into the ECM.

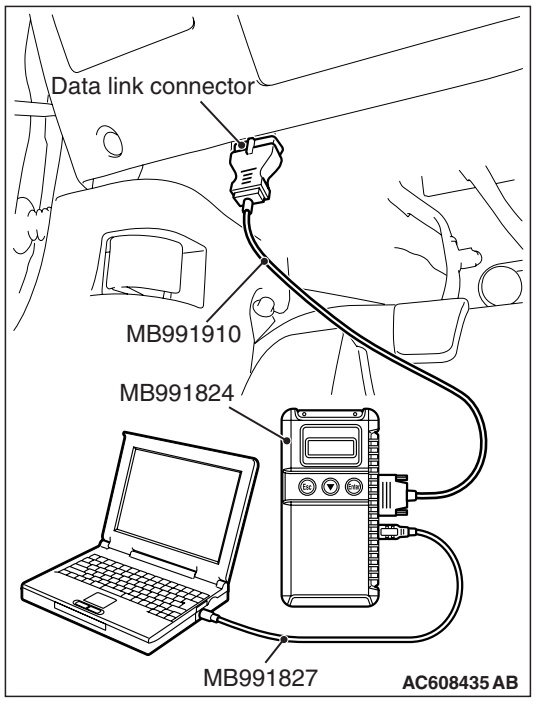
OBD-II DRIVE CYCLE PATTERN
None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

TSB Revision



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

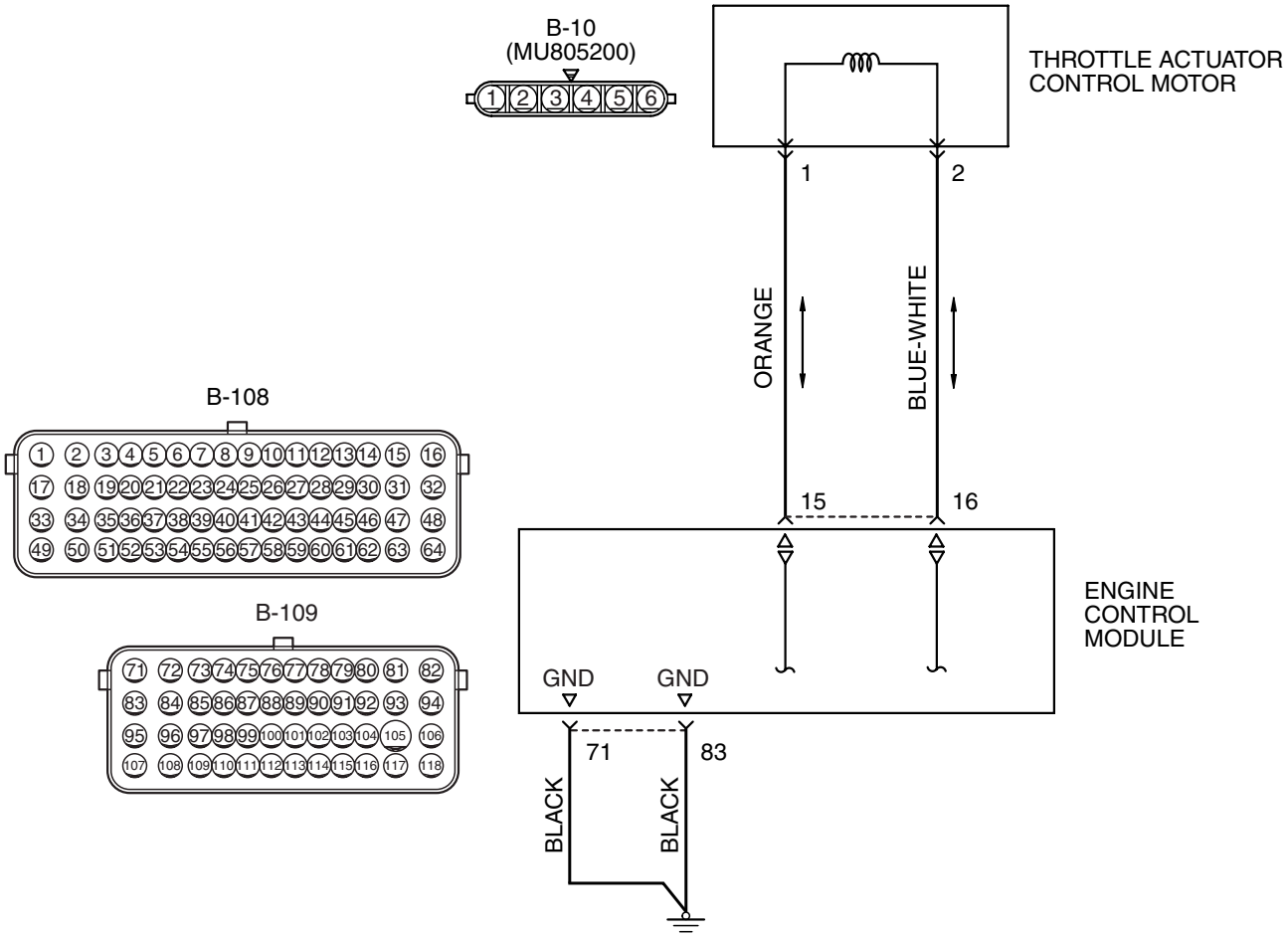
Q: Is DTC P1676 set?

YES : Replace the ECM with one into which vehicle information is correctly entered.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P2100: Throttle Actuator Control Motor Circuit (open)

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



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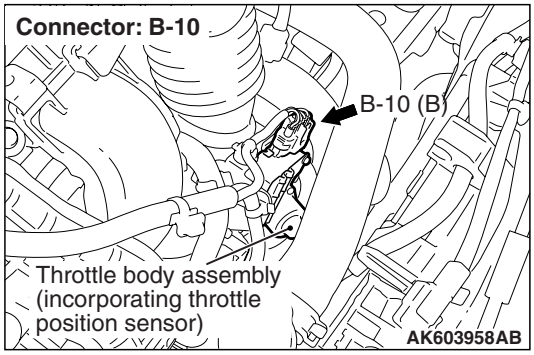
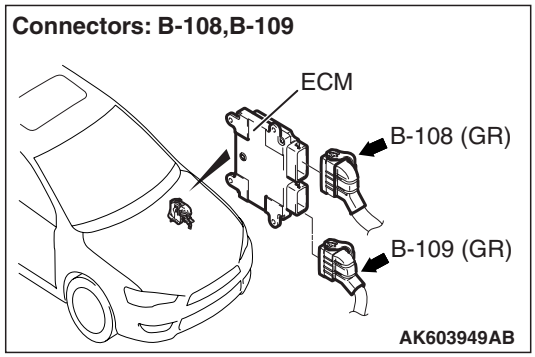




CIRCUIT OPERATION

- Controls the current that is applied from the ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2).

TSB Revision

TECHNICAL DESCRIPTION

- ECM varies the direction and the amperage of the current that is applied to the throttle actuator control motor in order to control the opening of the throttle valve.

DESCRIPTIONS OF MONITOR METHODS

The voltage difference between the throttle position sensor output voltage and the throttle position sensor output at the throttle actuator control motor relay off is smaller than the specified value.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.
- The output voltage of the throttle position sensor (main) minus the proposed output voltage becomes 0.1 volt or more.
- The output voltage of the throttle position sensor (sub) minus the proposed output voltage becomes 0.1 volt or more.
- The drive duty of the throttle actuator control motor is 100 percent or more.

or

- Battery positive voltage is higher than 8.3 volts.
- The proposed output voltage minus the output voltage of the throttle position sensor (main) becomes 0.1 volt or more.
- The proposed output voltage minus the output voltage of the throttle position sensor (sub) becomes 0.1 volt or more.
- The drive duty of the throttle actuator control motor is 100 percent or more.

Judgement Criteria

- The output voltage of the throttle position sensor (main) minus the learning value of the middle -opened degree becomes 0.2 volt or less for 0.4 second.

or

- The output voltage of the throttle position sensor (sub) minus the learning value of the middle -opened degree becomes 0.2 volt or less for 0.4 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed.
- Open throttle actuator control motor circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

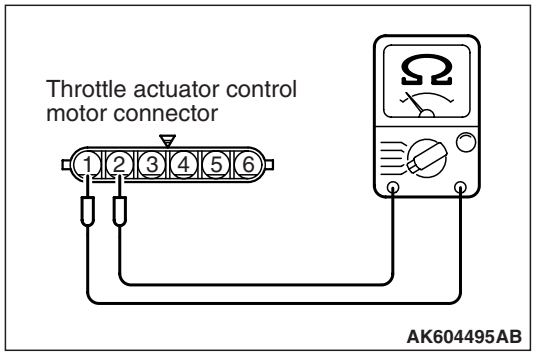
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-10 at throttle actuator control motor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.



STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-10.
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 –80 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20° C (68° F)]?

YES : Go to Step 3.
NO : Replace the throttle body assembly. Then go to Step 9.

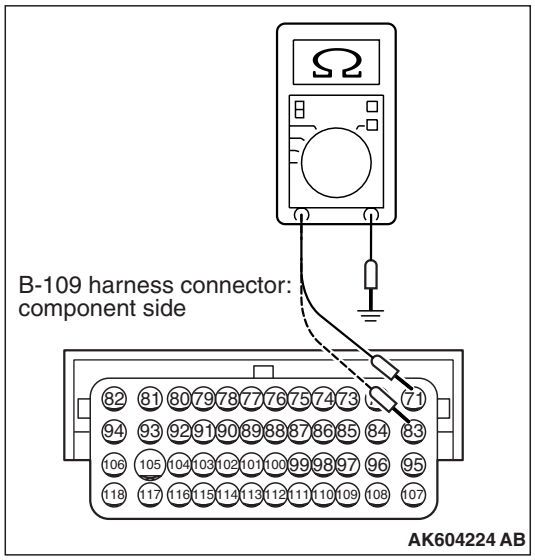
STEP 3. Check harness connector B-109 at ECM for damage

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 4. Check the continuity at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Measure the continuity between terminals No. 71, No. 83 and ground.
- Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 5.
NO : Repair harness wire between ECM connector B-109 (terminals No. 71, No. 83) and ground because of open circuit or harness damage. Then go to Step 9.

STEP 5. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 6.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 9.

STEP 6. Check for open circuit and harness damage between throttle actuator control motor connector B-10 (terminal No. 1) and ECM connector B-108 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Go to Step 7.
NO : Repair it. Then go to Step 9.

STEP 7. Check for open circuit and harness damage between throttle actuator control motor connector B-10 (terminal No. 2) and ECM connector B-108 (terminal No. 16).

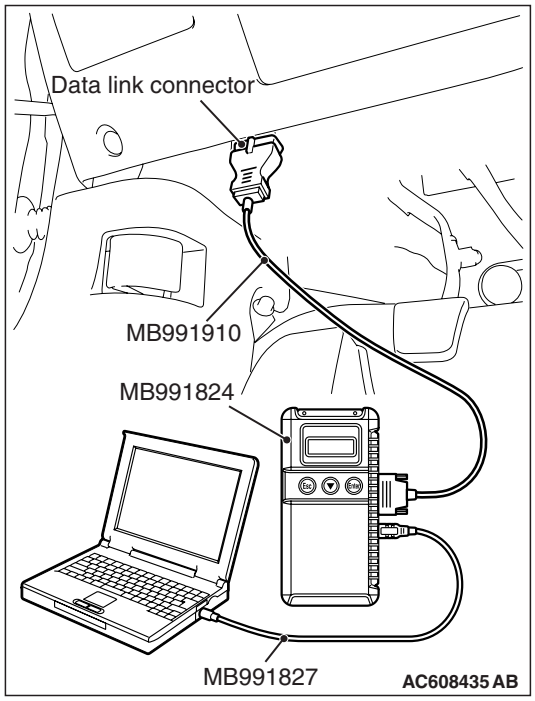
Q: Is the harness wire in good condition?

YES : Go to Step 8.
NO : Repair it. Then go to Step 9.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

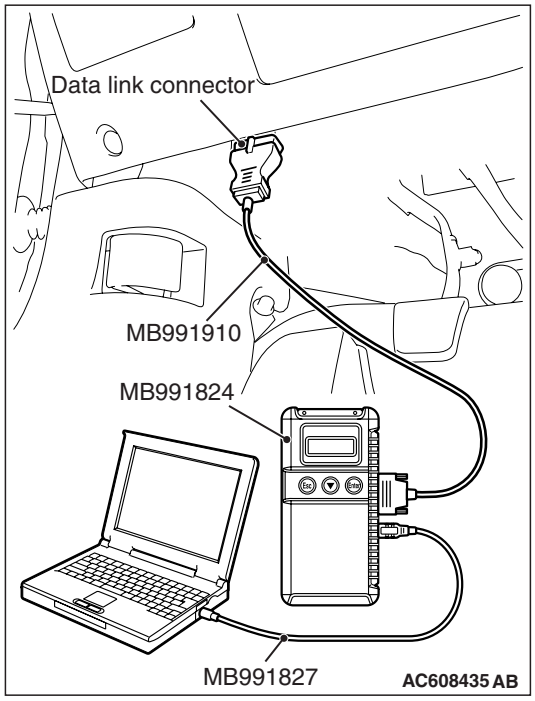
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is DTC P2100 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 9.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



STEP 9. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

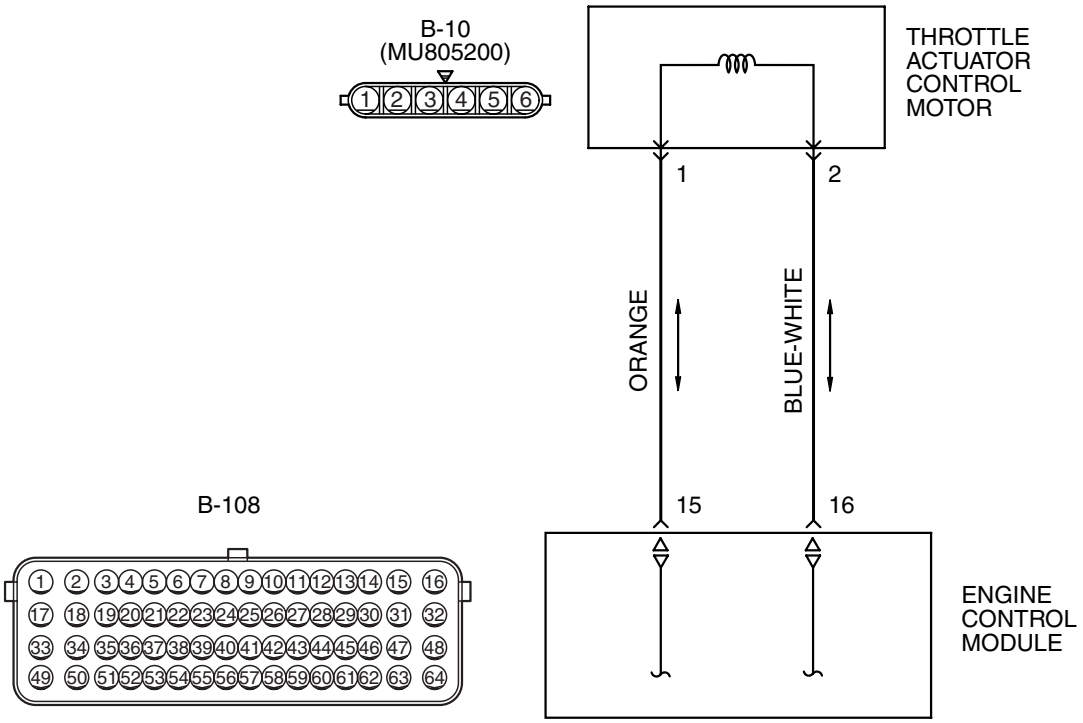
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2100 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2101: Throttle Actuator Control Motor Magneto Malfunction

THROTTLE ACTUATOR CONTROL MOTOR CIRCUIT



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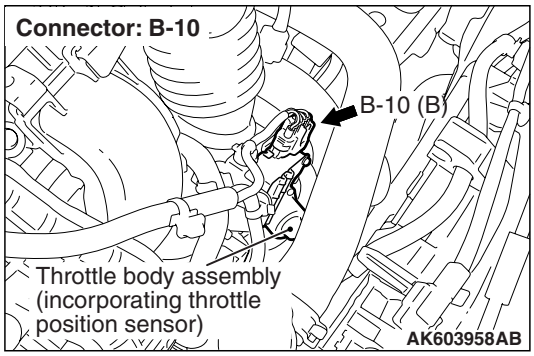
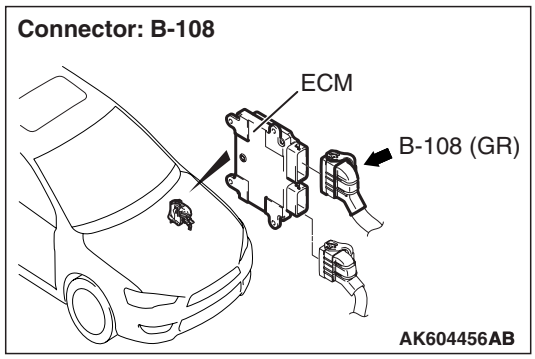




CIRCUIT OPERATION

- Controls the current that is applied from ECM (terminals No. 15, No. 16) to the throttle actuator control motor (terminals No. 1, No. 2)

TECHNICAL DESCRIPTION

- ECM check whether the throttle actuator control motor magneto has failed.

TSB Revision

DESCRIPTIONS OF MONITOR METHODS

Throttle actuator control motor intelligent power device detects shorted-high/low and overheat of itself.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Check Condition

- Battery positive voltage is higher than 8.3 volts.

Judgement Criterion

- The coil current of the throttle actuator control motor is 8 ampere or more for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle actuator control motor failed.
- Shorted throttle actuator control motor circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-10 at throttle actuator control motor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 2. Check the throttle actuator control motor.

(1) Disconnect the connector B-10.

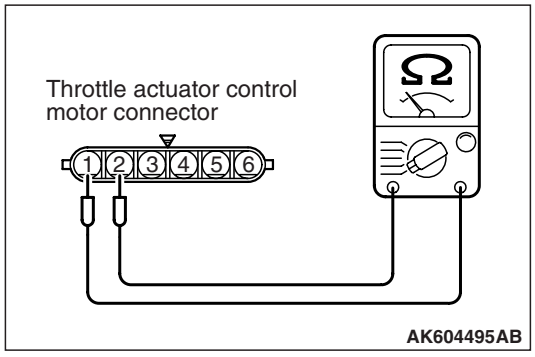
(2) Measure the resistance between throttle actuator control motor side connector terminal No. 1 and No. 2.

Standard value: 0.3 –80 ohms [at 20° C (68° F)]

Q: Is the measured resistance between 0.3 and 80 ohms [at 20° C (68° F)]?

YES : Go to Step 3.

NO : Replace the throttle body assembly. Then go to Step 7.



STEP 3. Check harness connector B-108 at ECM for damage

Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 7.

STEP 4. Check for short circuit to ground between throttle actuator control motor connector B-10 (terminal No. 1) and ECM connector B-108 (terminal No. 15).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 7.

STEP 5. Check for short circuit to ground between throttle actuator control motor connector B-10 (terminal No. 2) and ECM connector B-108 (terminal No. 16).

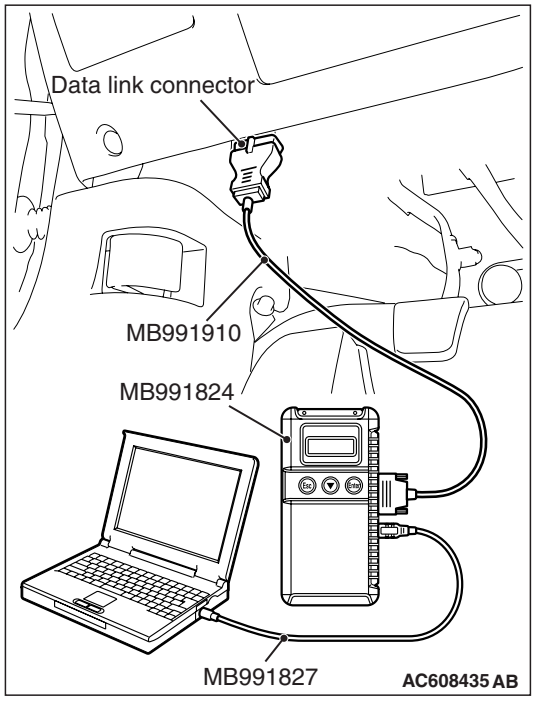
Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 7.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

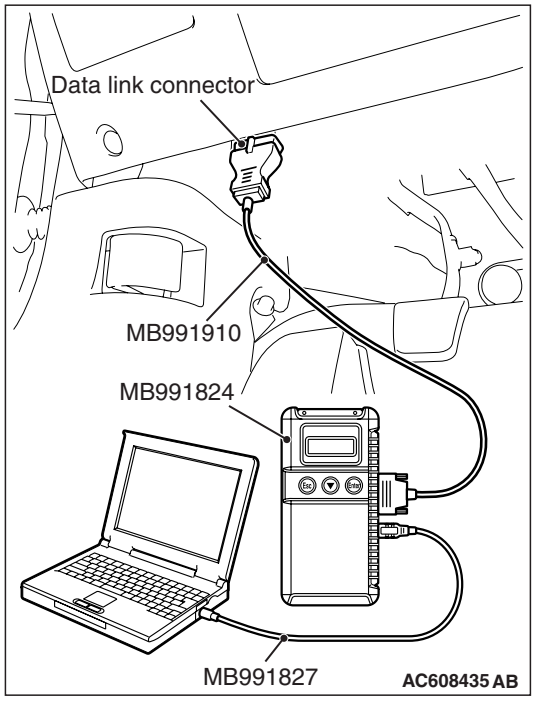
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is DTC P2101 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 7.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



STEP 7. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

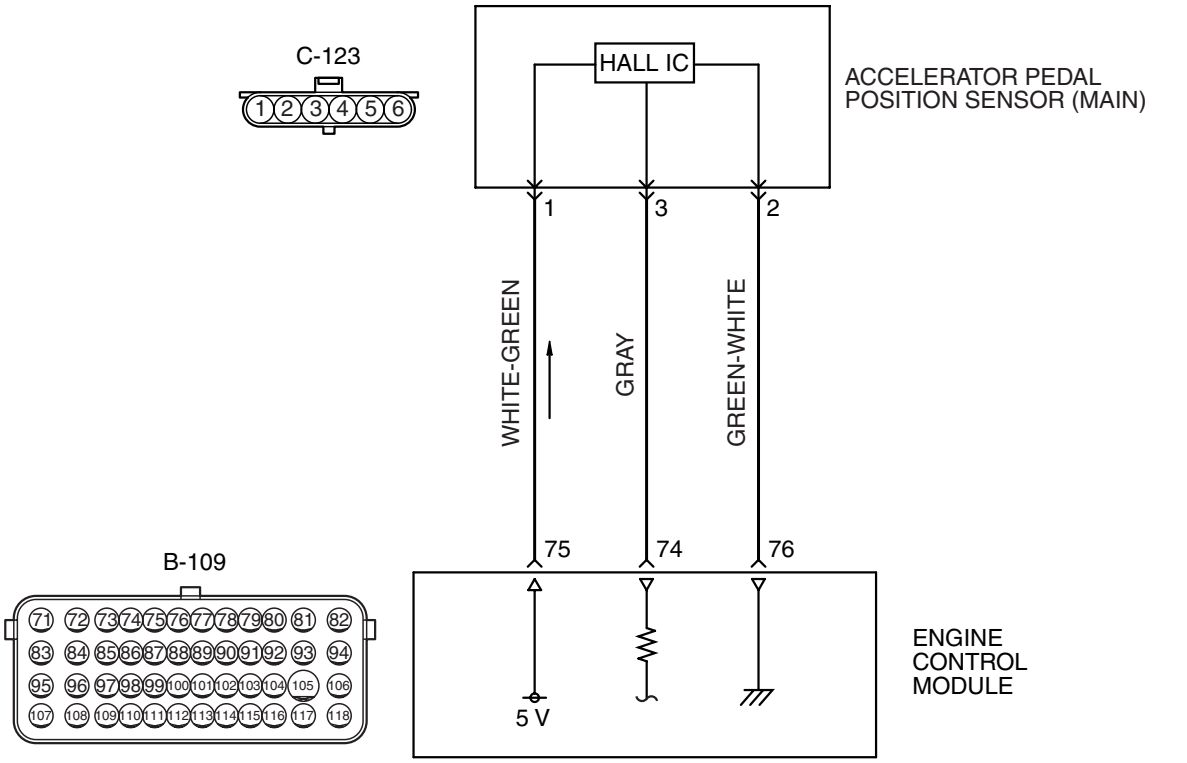
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2101 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2122: Accelerator Pedal Position Sensor (main) Circuit Low Input

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



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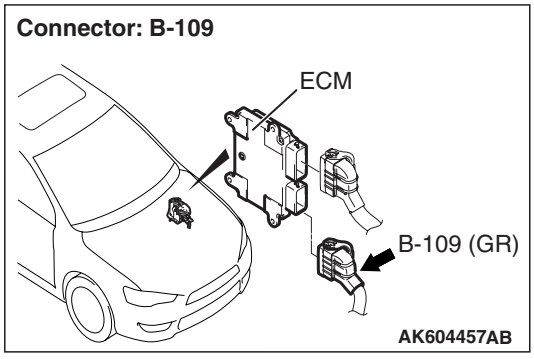
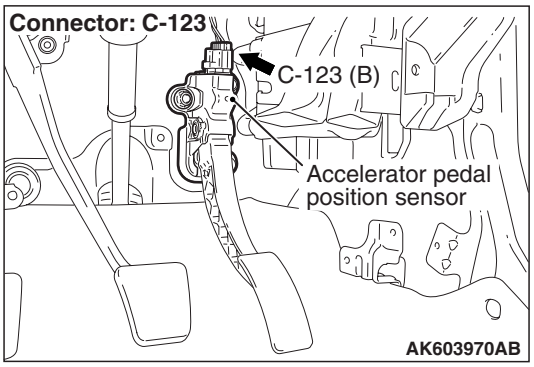




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 74) from the accelerator pedal position sensor (main) output terminal (terminal No. 3).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

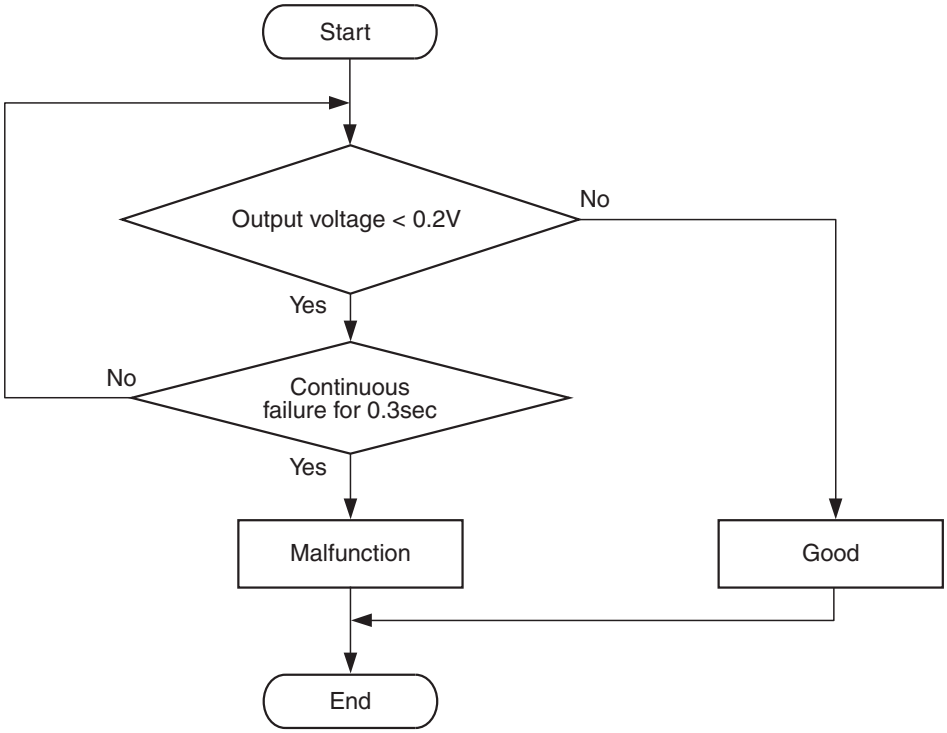
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage is 0.2 volt or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Open or shorted accelerator pedal position sensor (main) circuit, harness damage or connector damage.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

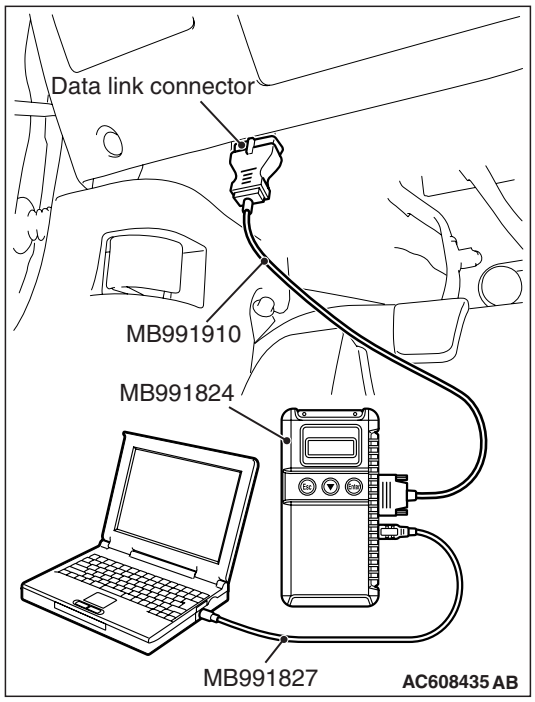
STEP 1. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
  - Output voltage is between 0.9 and 1.1 volts when foot is released from accelerator pedal.
  - Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

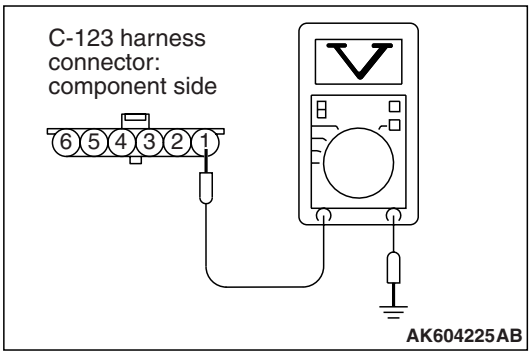
NO : Go to Step 2.

STEP 2. Check harness connector C-123 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 5. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector C-123 (terminal No. 1) and ECM connector B-109 (terminal No. 75).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.

STEP 6. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0. 9 and 1.1 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

STEP 7. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 8. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 1) and ECM connector B-109 (terminal No. 75).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for open circuit, short circuit to ground and harness damage between accelerator pedal position sensor connector C-123 (terminal No. 3) and ECM connector B-109 (terminal No. 74).

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP 10. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2122 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : The inspection is complete.

STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

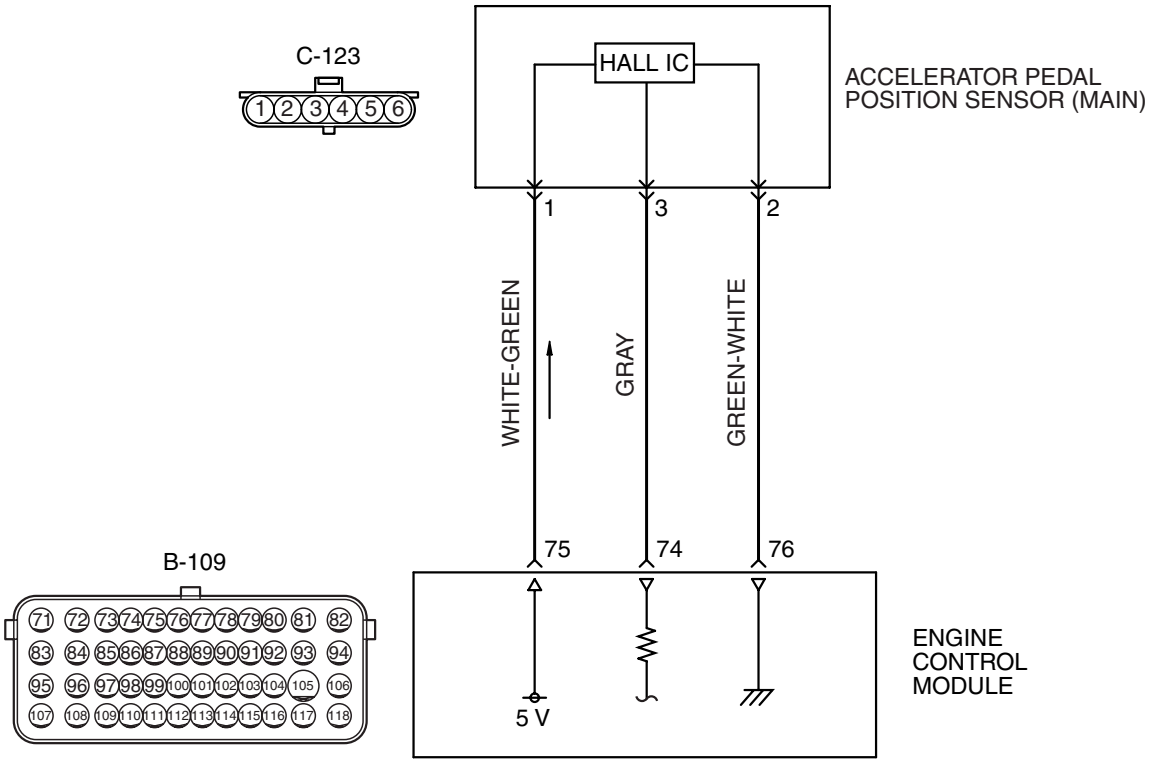
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2122 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2123: Accelerator Pedal Position Sensor (main) Circuit High Input

ACCELERATOR PEDAL POSITION SENSOR (MAIN) CIRCUIT



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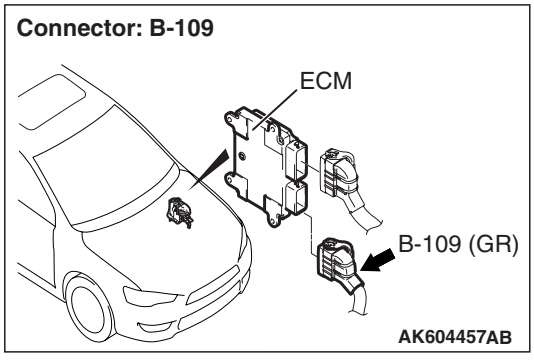
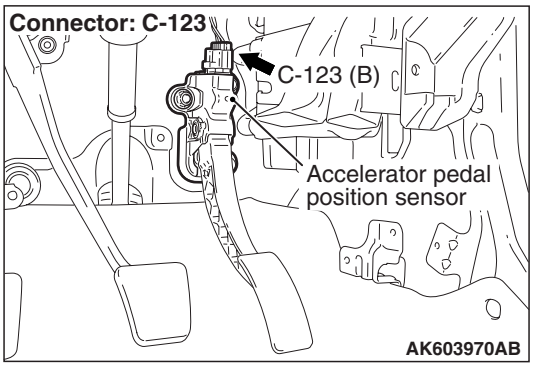




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (main) power terminal (terminal No. 1) from the ECM (terminal No. 75).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 74) from the accelerator pedal position sensor (main) output terminal (terminal No. 3).
- The ground terminal (terminal No. 2) is grounded with ECM (terminal No. 76).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (main) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (main) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

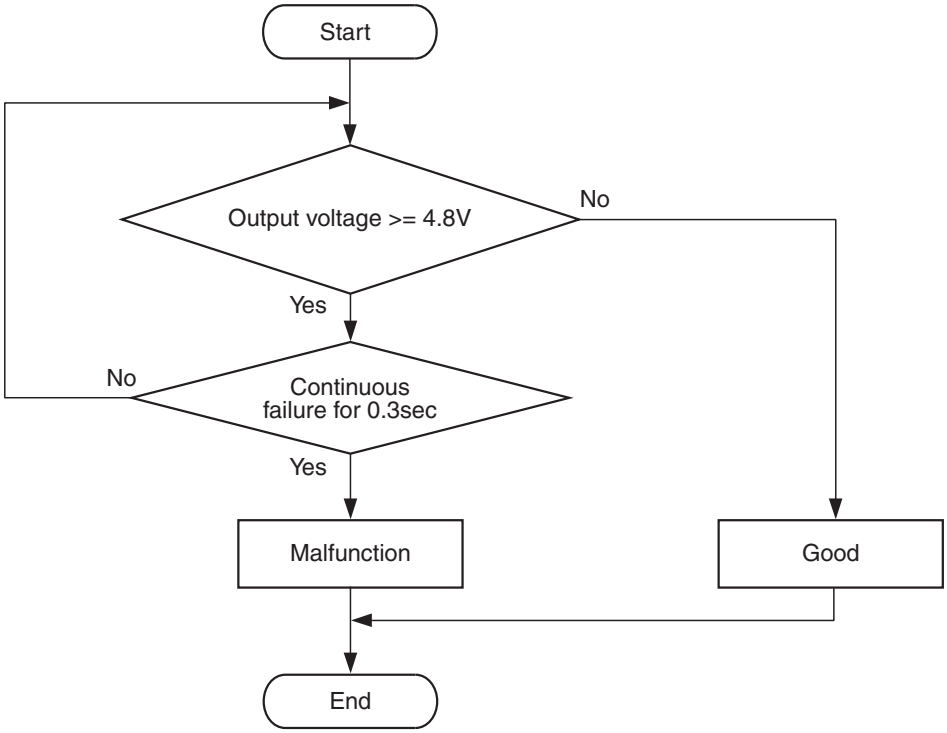
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (main) output voltage should be 4.8 volts or higher for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Open accelerator pedal position sensor (main) circuit, harness damage or connector damage.
- ECM failed.

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DIAGNOSIS

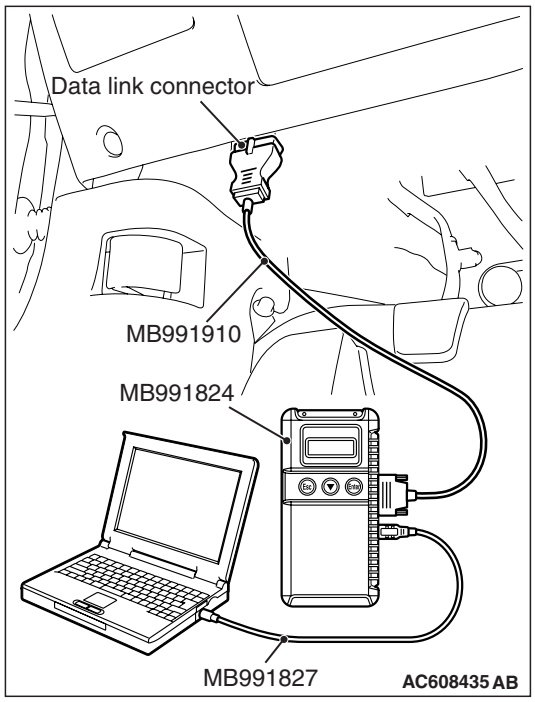
Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
  - Output voltage is between 0.9 and 1.1 volts when foot is released from accelerator pedal.
  - Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

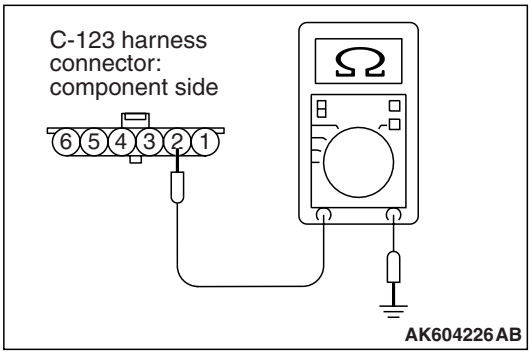
NO : Go to Step 2.

STEP 2. Check harness connector C-123 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Measure the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Check for open circuit and harness damage between accelerator pedal position sensor connector C-123 (terminal No. 2) and ECM connector B-109 (terminal No. 76).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data list item 11: Accelerator Pedal Position Sensor (main).

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 11, Accelerator Pedal Position Sensor (main).
- Output voltage is between 0.9 and 1.1 volts when foot is released from accelerator pedal.
- Output voltage is 4.0 volts or higher when accelerator pedal is fully depressed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

TSB Revision

STEP 7. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2123 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : The inspection is complete.

STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

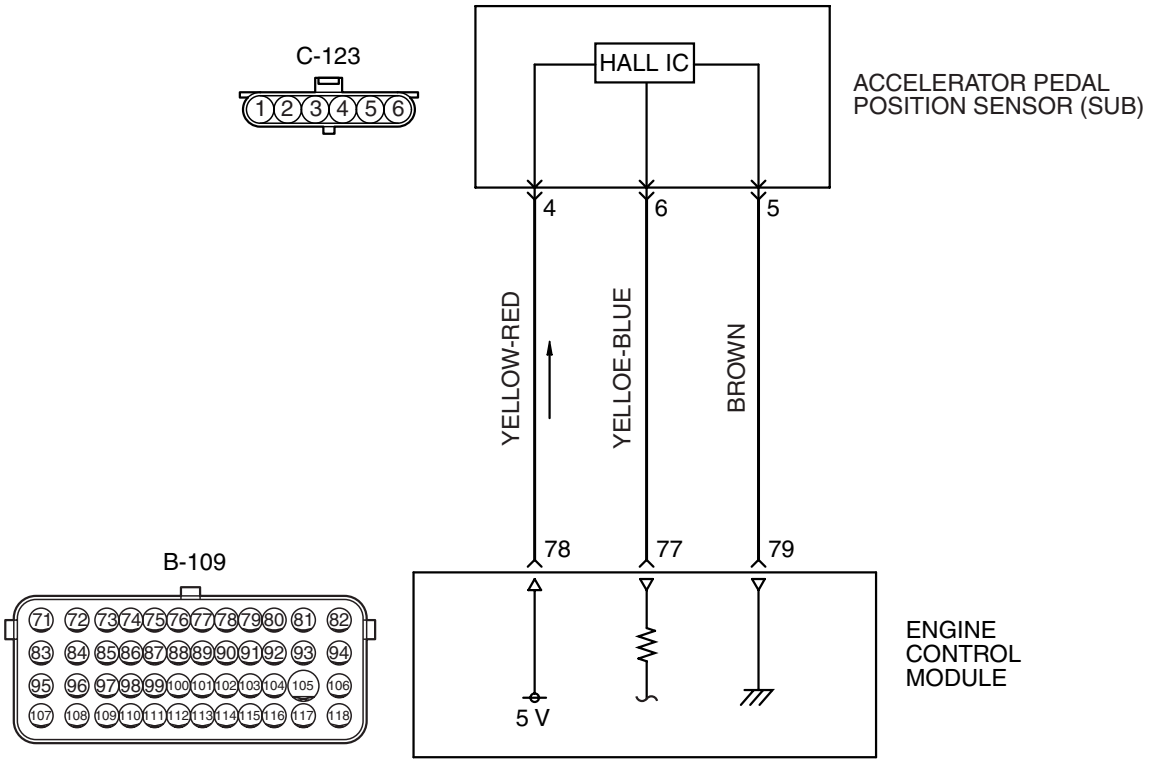
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2123 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2127: Accelerator Pedal Position Sensor (sub) Circuit Low Input

ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



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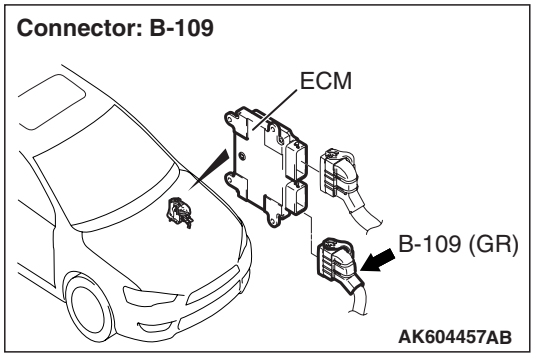
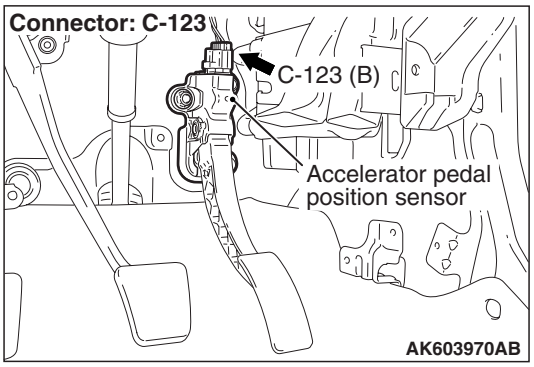




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 77) from the accelerator pedal position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

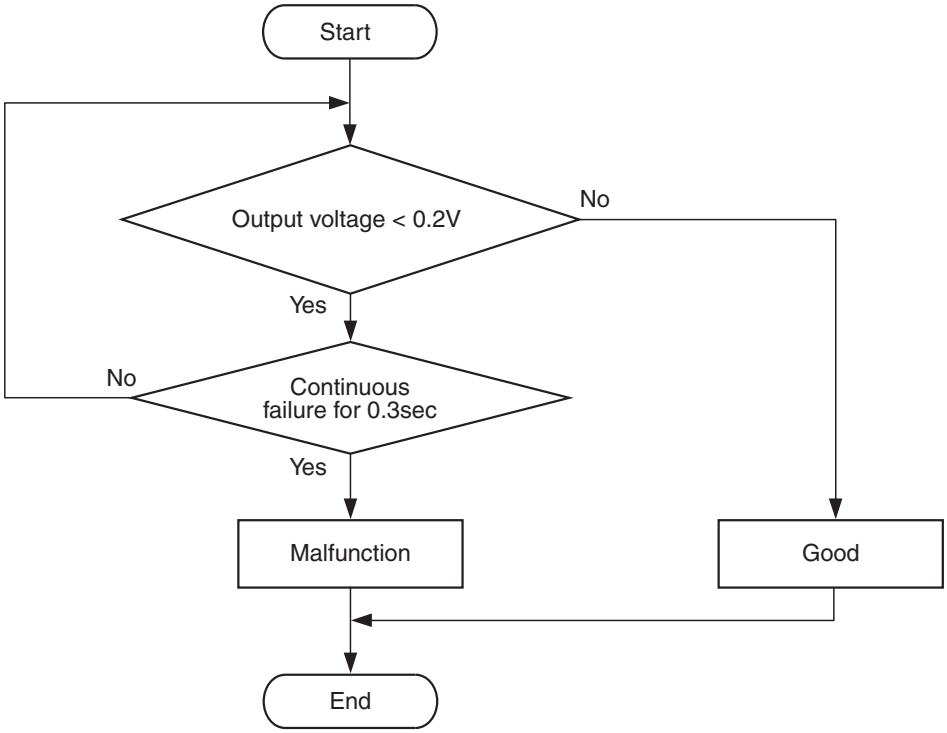
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 0.2 volt or less for 0.3 second.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Open or shorted accelerator pedal position sensor (sub) circuit, harness damage or connector damage.
- ECM failed.

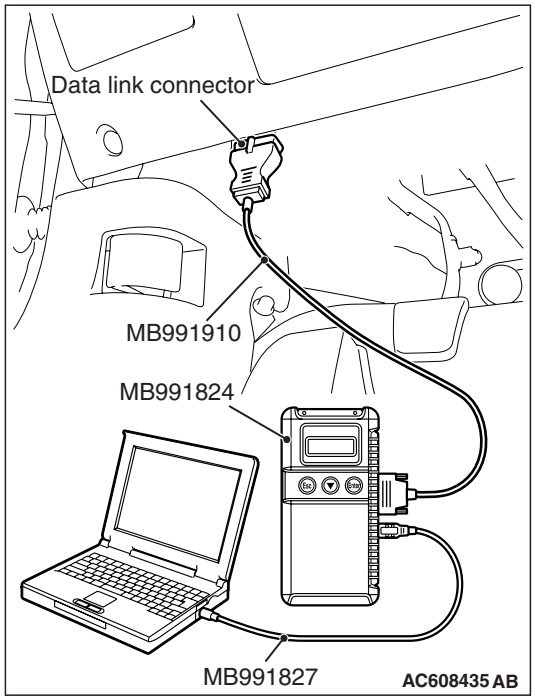
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
  - Output voltage is between 0.4 and 0.6 volt when foot is released from accelerator pedal.
  - Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

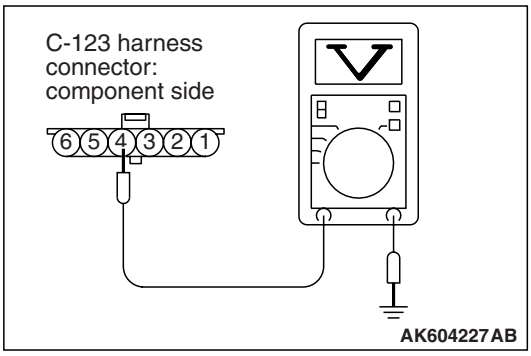
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector C-123 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.



STEP 3. Measure the sensor supply voltage at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 4 and ground.
- Voltage should be between 4.9 and 5.1 volts.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the measured voltage between 4.9 and 5.1 volts?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 5. Check for open circuit and short circuit to ground between accelerator pedal position sensor connector C-123 (terminal No. 4) and ECM connector B-109 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 11.

STEP 6. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.4 and 0.6 volt when foot is released from accelerator pedal.
- Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

STEP 7. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 8. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 4) and ECM connector B-109 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for open circuit, short circuit to ground and harness damage between accelerator pedal position sensor connector C-123 (terminal No. 6) and ECM connector B-109 (terminal No. 77)

Q: Is the harness wire in good condition?

YES : Go to Step 10.

NO : Repair it. Then go to Step 11.

STEP 10. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2127 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : The inspection is complete.

STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

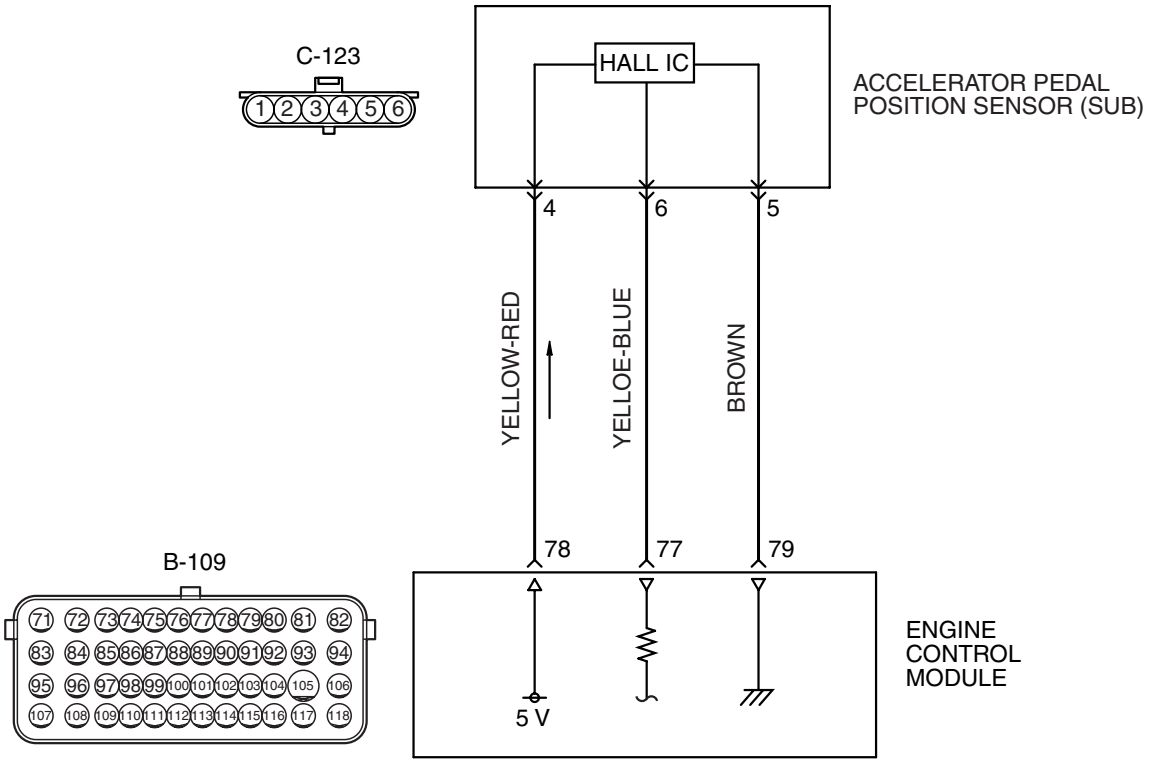
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2127 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2128: Accelerator Pedal Position Sensor (sub) Circuit High Input

ACCELERATOR PEDAL POSITION SENSOR (SUB) CIRCUIT



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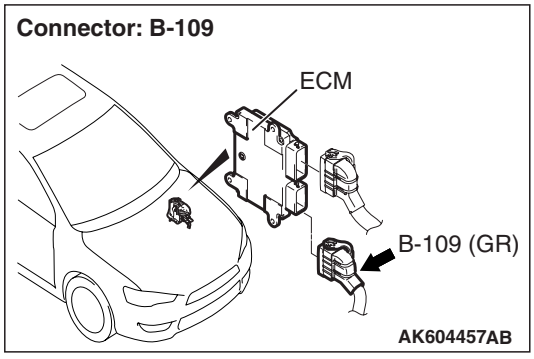
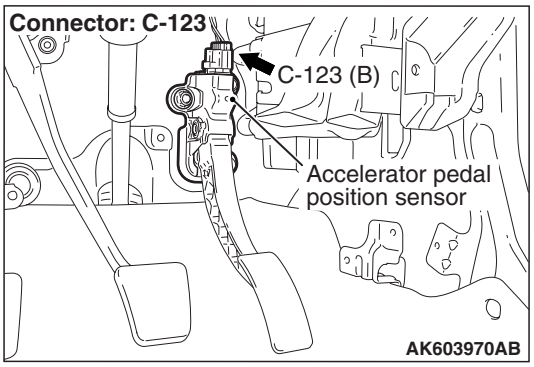




CIRCUIT OPERATION

- A 5-volt power supply is applied on the accelerator pedal position sensor (sub) power terminal (terminal No. 4) from the ECM (terminal No. 78).
- A voltage that is according to the accelerator opening angle is sent to the ECM (terminal No. 77) from the accelerator pedal position sensor (sub) output terminal (terminal No. 6).
- The ground terminal (terminal No. 5) is grounded with ECM (terminal No. 79).

TSB Revision

TECHNICAL DESCRIPTION

- The accelerator pedal position sensor (sub) outputs voltage which corresponds to the accelerator pedal depression.
- The ECM checks whether the voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Accelerator pedal position sensor (sub) output voltage is out of specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

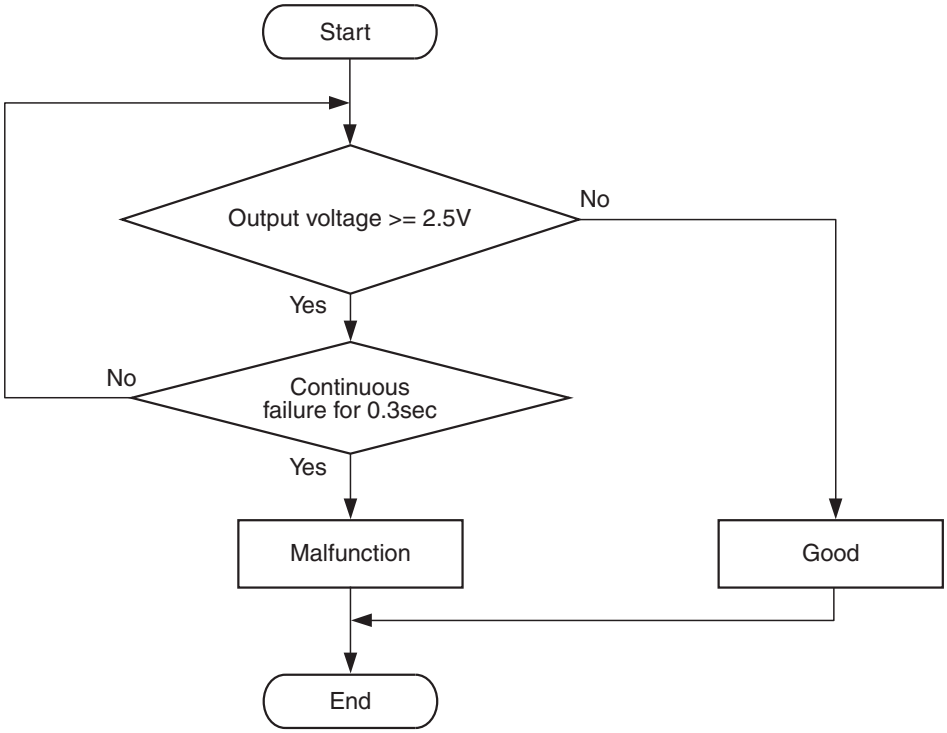
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604340

Check Condition

- Ignition switch is "ON" position.

Judgement Criterion

- Accelerator pedal position sensor (sub) output voltage is 2.5 volts or higher for 0.3 second.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Open accelerator pedal position sensor (sub) circuit, harness damage or connector damage.
- ECM failed.

OBD-II DRIVE CYCLE PATTERN

None.

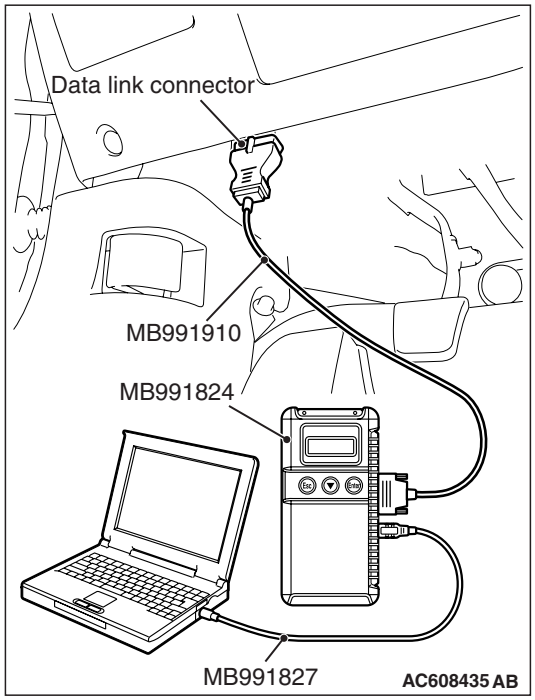
TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).



⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
  - Output voltage is between 0.4 and 0.6 volt when foot is released from accelerator pedal.
  - Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

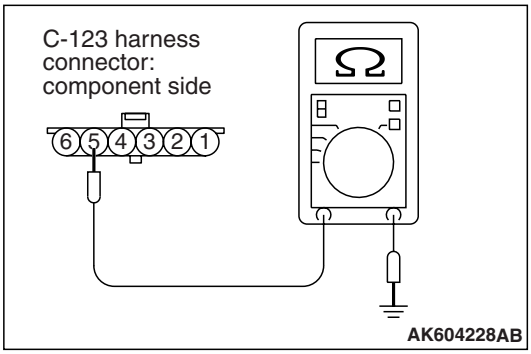
Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Go to Step 2.

STEP 2. Check harness connector C-123 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.



STEP 3. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Measure the continuity between terminal No. 5 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 7.
NO : Go to Step 4.

STEP 4. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 5.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 8.

STEP 5. Check for open circuit and harness damage between accelerator pedal position sensor connector C-123 (terminal No. 5) and ECM connector B-109 (terminal No. 79).

Q: Is the harness wire in good condition?

YES : Go to Step 6.
NO : Repair it. Then go to Step 8.

STEP 6. Using scan tool MB991958, check data list item 12: Accelerator Pedal Position Sensor (sub).

(1) Turn the ignition switch to the "ON" position.
(2) Set scan tool MB991958 to the data reading mode for item 12, Accelerator Pedal Position Sensor (sub).
- Output voltage is between 0.4 and 0.6 volt when foot is released from accelerator pedal.
- Output voltage is 2.0 volts or higher when accelerator pedal is fully depressed.

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.

TSB Revision

STEP 7. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2128 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 8.
NO : The inspection is complete.

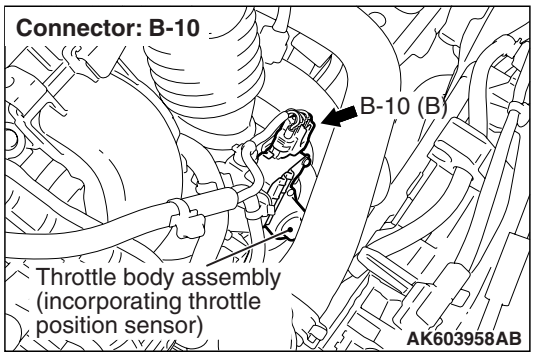
STEP 8. Using scan tool MB991958, read the diagnostic trouble code (DTC).

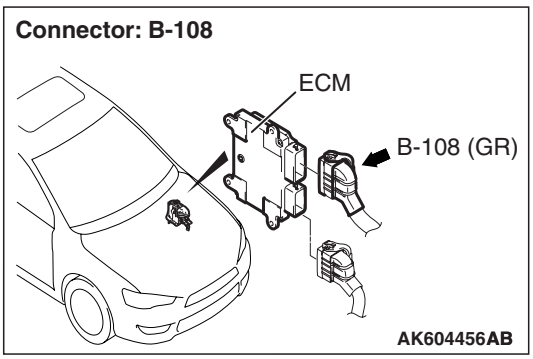
(1) Turn the ignition switch to the "ON" position.
(2) After the DTC has been deleted, read the DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2128 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2135: Throttle Position Sensor (main and sub) Range/Performance Problem





THROTTLE POSITION SENSOR (main and sub) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P0122 –Throttle Position Sensor (main) Circuit Low Input P.13A-206.
- Refer to DTC P0222 –Throttle Position Sensor (sub) Circuit Low Input P.13A-407.

CIRCUIT OPERATION

- Refer to DTC P0122 –Throttle Position Sensor (main) Circuit Low Input P.13A-206.
- Refer to DTC P0222 –Throttle Position Sensor (sub) Circuit Low Input P.13A-407.

TECHNICAL DESCRIPTION

- ECM checks the throttle position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between throttle position sensor (main) and throttle position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

TSB Revision

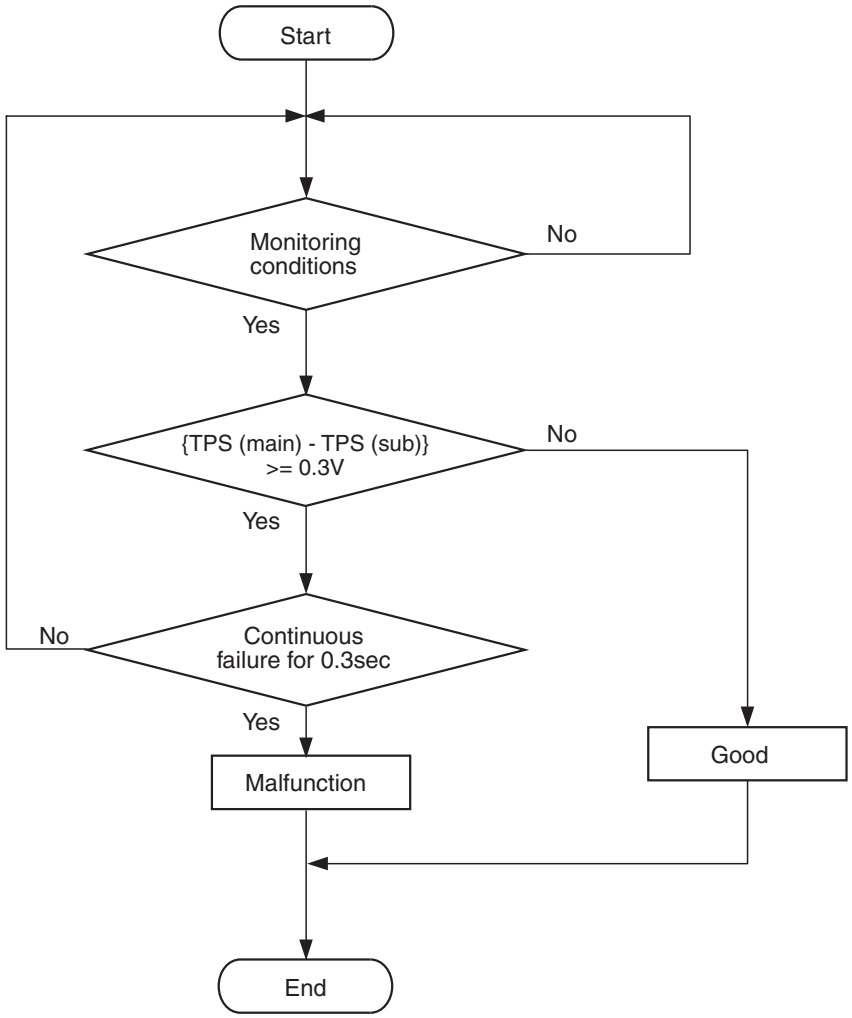
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

DTC SET CONDITIONS <Range/Performance problem-relation between main and sub>

Logic Flow Chart



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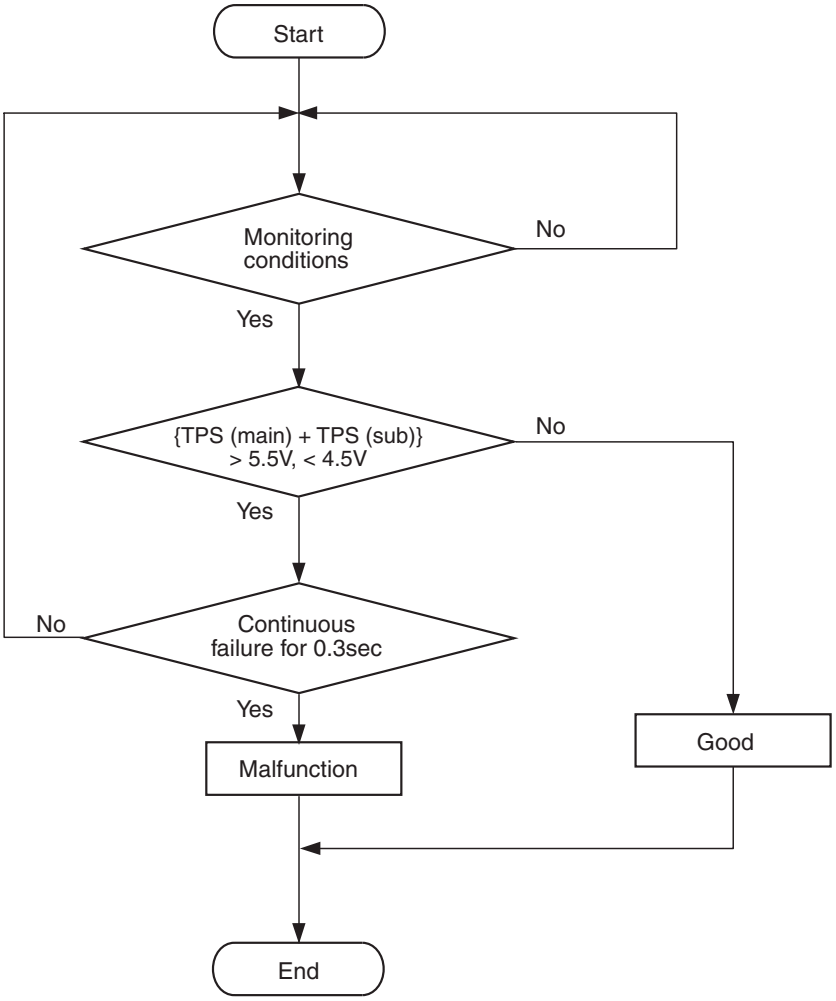
Check Conditions
- The target output voltage of the throttle position sensor is 0.9 volt or less.
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.
- Battery positive voltage is higher than 8.3 volts.

TSB Revision

Judgement Criterion
- Voltage obtained with the formula given below is 0.3 volt or higher for 0.3 second: [throttle position sensor (main) voltage –throttle position sensor (sub) voltage]

NOTE: The throttle position sensor voltage used for the judgement is converted into the throttle position sensor voltage for the internal processing by the ECM.

Logic Flow Chart



AK604362

Check Conditions
- Throttle position sensor (main) output voltage is between 0.2 and 4.8 volts.
- Throttle position sensor (sub) output voltage is between 0.2 and 4.8 volts.

Judgement Criterion
- For 0.3 second, the sum of the output voltage of the throttle position sensors (main) and (sub) is 4.5 V or less, or 5.5 V or more.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Throttle position sensor failed.
- Harness damage in throttle position sensor circuit or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

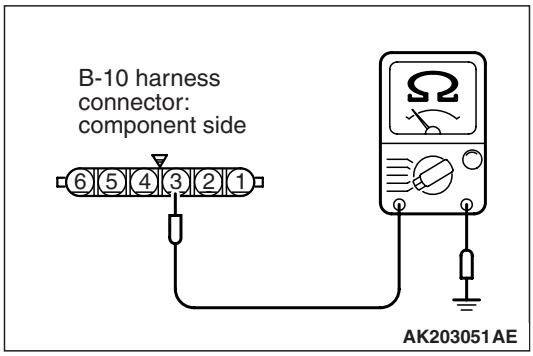
STEP 1. Check harness connector B-10 at throttle position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 2. Check the continuity at throttle position sensor harness side connector B-10.

(1) Disconnect the connector B-10 and measure at the harness side.
(2) Measure the continuity between terminal No. 3 and ground.
- Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Check harness connector B-108 at ECM for damage.

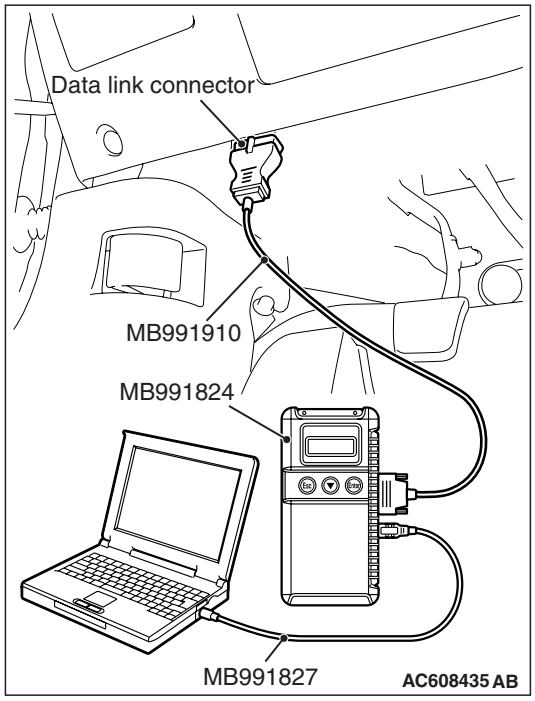
Q: Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 4. Check for harness damage between throttle position sensor connector B-10 (terminal No. 3) and ECM connector B-108 (terminal No. 13).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 11.



STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Depress the accelerator pedal fully for a few seconds.
(5) Check the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2135 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 6. Check harness connector B-108 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 7.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 11.

STEP 7. Check for harness damage between throttle position sensor connector B-10 (terminal No. 5) and ECM connector B-108 (terminal No. 12).

Q: Is the harness wire in good condition?

YES : Go to Step 8.

NO : Repair it. Then go to Step 11.

STEP 8. Check for harness damage between throttle position sensor connector B-10 (terminal No. 4) and ECM connector B-108 (terminal No. 10).

Q: Is the harness wire in good condition?

YES : Go to Step 9.

NO : Repair it. Then go to Step 11.

STEP 9. Check for harness damage between throttle position sensor connector B-10 (terminal No. 6) and ECM connector B-108 (terminal No. 11).

Q: Is the harness wire in good condition?

YES : Go to Step 10.
NO : Repair it. Then go to Step 11.

STEP 10. Replace the throttle body assembly.

(1) Replace the throttle body assembly.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Depress the throttle fully for a few seconds.
(5) Check the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2135 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 11.
NO : The inspection is complete.

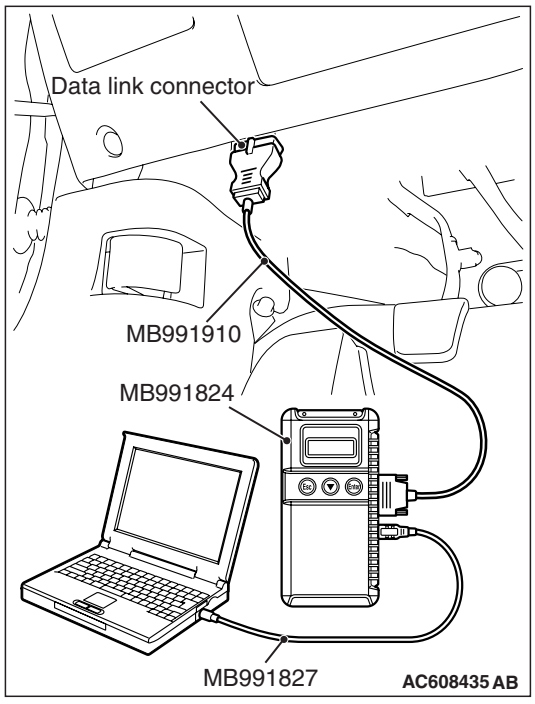
STEP 11. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

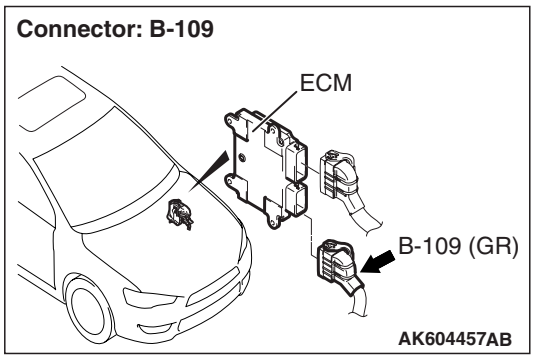
(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Erase the DTC.
(4) Depress the throttle fully for a few seconds.
(5) Check the DTC.
(6) Turn the ignition switch to the "LOCK" (OFF) position.

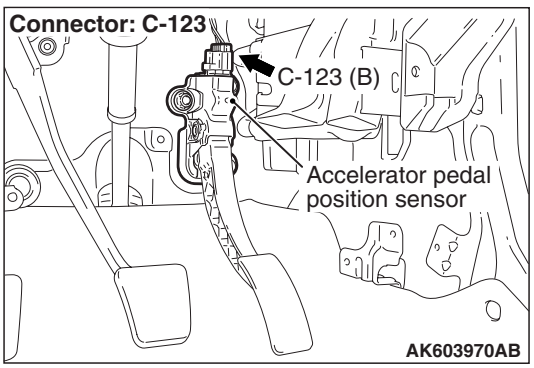
Q: Is DTC P2135 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.



DTC P2138: Accelerator Pedal Position Sensor (main and sub) Circuit Range/Performance Problem





ACCELERATOR PEDAL POSITION SENSOR (main and sub) RANGE/PERFORMANCE PROBLEM CIRCUIT

- Refer to DTC P2122 –Accelerator Pedal Position Sensor (main) Circuit Low Input P.13A-722.
- Refer to DTC P2127 –Accelerator Pedal Position Sensor (sub) Circuit Low Input P.13A-733.

CIRCUIT OPERATION

- Refer to DTC P2122 –Accelerator Pedal Position Sensor (main) Circuit Low Input P.13A-722.
- Refer to DTC P2127 –Accelerator Pedal Position Sensor (sub) Circuit Low Input P.13A-733.

TECHNICAL DESCRIPTION

- ECM checks the accelerator pedal position sensor output signal characteristics for abnormal conditions.

DESCRIPTIONS OF MONITOR METHODS

Detect malfunction if the relation between accelerator pedal position sensor (main) and accelerator pedal position sensor (sub) is wrong.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

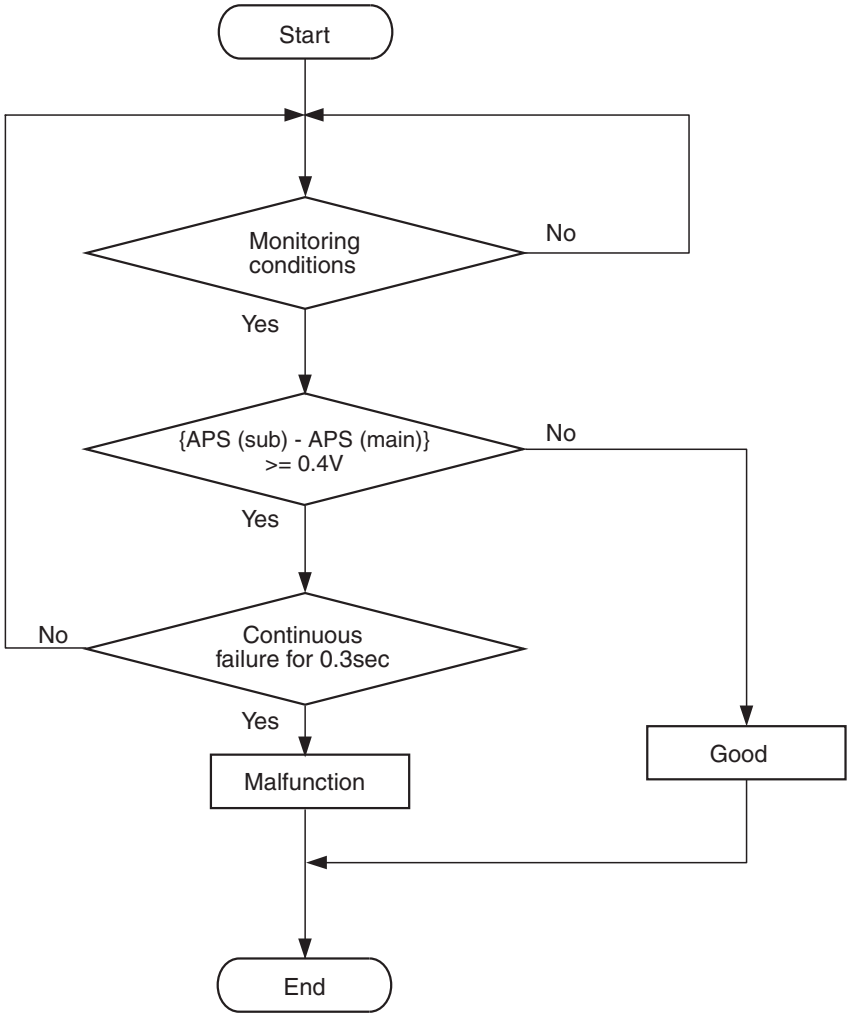
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



AK604363

Check Conditions

- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

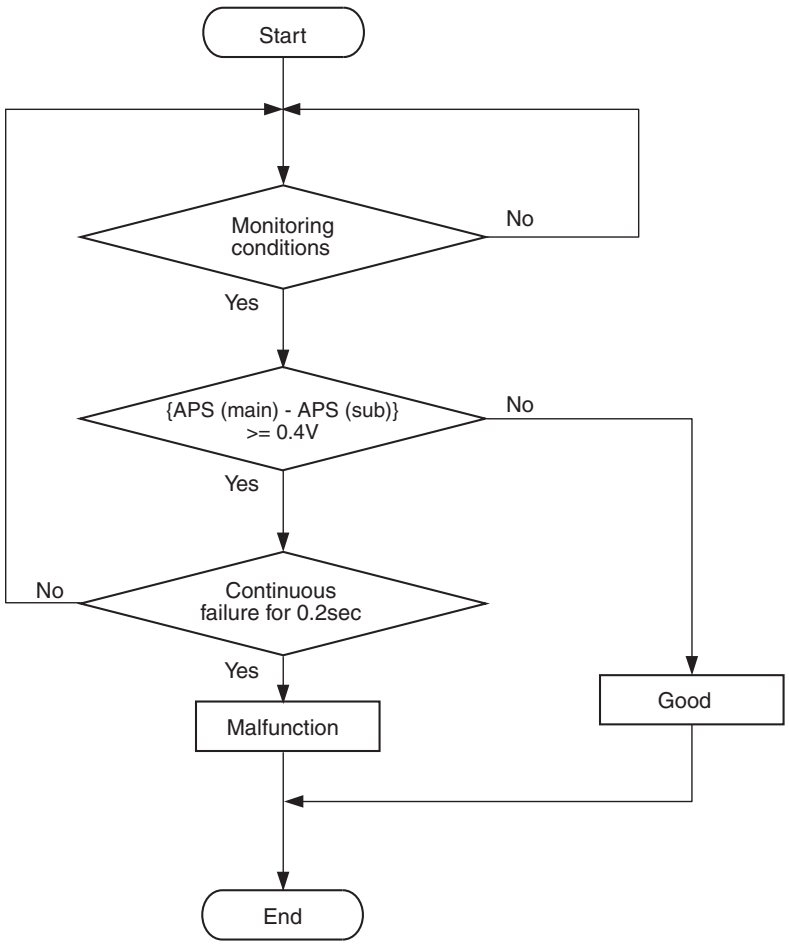
- Voltage obtained with the formula given below is 0.4 volt or higher for 0.3 second: [accelerator pedal position sensor (sub) voltage –accelerator pedal position sensor (main) voltage].

NOTE: The accelerator pedal position sensor voltage used for the judgement is converted into the accelerator pedal position sensor voltage for the internal processing by the ECM.

TSB Revision

DTC SET CONDITIONS <Range/Performance problem -relation between main and sub>

Logic Flow Chart



AK604364

Check Conditions

- Change of accelerator pedal position sensor (sub) output voltage per 25 milliseconds is lower than 0.06 volt.

Judgement Criterion

- Voltage obtained with the formula given below is 0.4 volt or higher for 0.2 second: [accelerator pedal position sensor (main) voltage –accelerator pedal position sensor (sub) voltage].

  NOTE: The accelerator pedal position sensor voltage used for the judgement is converted into the accelerator pedal position sensor voltage for the internal processing by the ECM.

OBD-II DRIVE CYCLE PATTERN

None.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Accelerator pedal position sensor failed.
- Harness damage in accelerator pedal position sensor circuit or connector damage.
- ECM failed.

TSB Revision

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

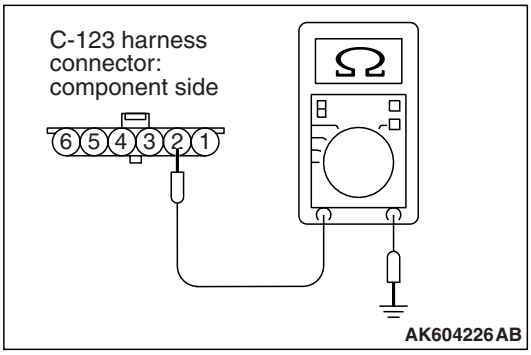
STEP 1. Check harness connector C-123 at accelerator pedal position sensor for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 2. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Measure the continuity between terminal No. 2 and ground.
- Continuity (2 ohms or less)



Q: Does continuity exist?

YES : Go to Step 6.
NO : Go to Step 3.

STEP 3. Check harness connector B-109 at ECM for damage.

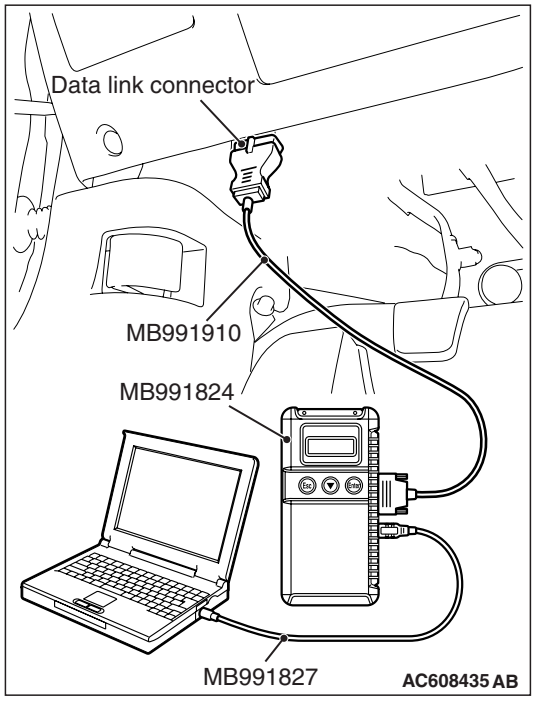
Q: Is the harness connector in good condition?

YES : Go to Step 4.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 4. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 2) and ECM connector B-109 (terminal No. 76).

Q: Is the harness wire in good condition?

YES : Go to Step 5.
NO : Repair it. Then go to Step 16.



STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

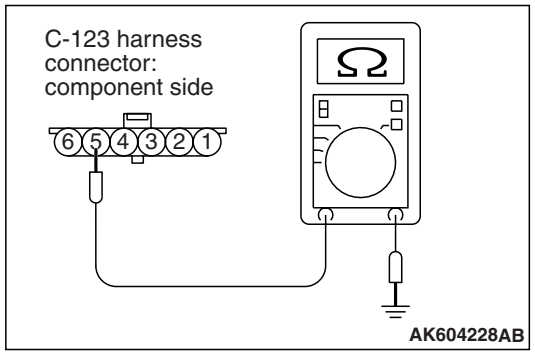
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 16.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.



STEP 6. Check the continuity at accelerator pedal position sensor harness side connector C-123.

(1) Disconnect the connector C-123 and measure at the harness side.
(2) Measure the continuity between terminal No. 5 and ground.
- Continuity (2 ohms or less)

Q: Does continuity exist?

YES : Go to Step 10.
NO : Go to Step 7.

STEP 7. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 8. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 5) and ECM connector B-109 (terminal No. 79).

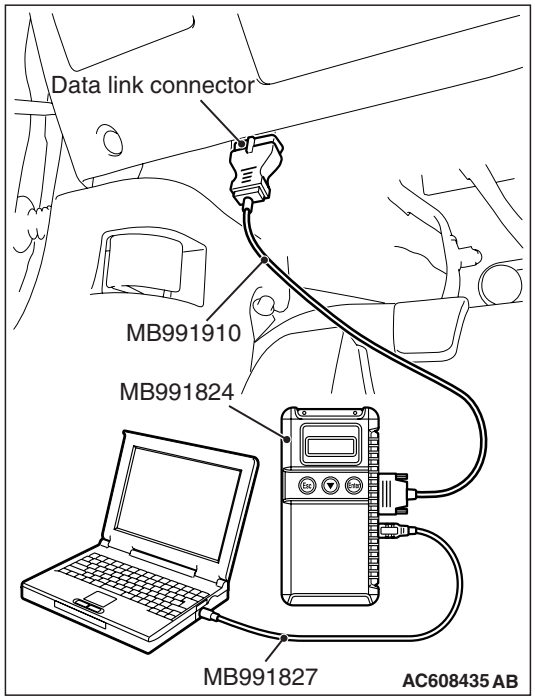
Q: Is the harness wire in good condition?

YES : Go to Step 9.
NO : Repair it. Then go to Step 16.

STEP 9. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is DTC P2138 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 16.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 10. Check harness connector B-109 at ECM for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 11.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 16.

STEP 11. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 1) and ECM connector B-109 (terminal No. 75).

Q: Is the harness wire in good condition?

YES : Go to Step 12.
NO : Repair it. Then go to Step 16.

STEP 12. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 4) and ECM connector B-109 (terminal No. 78).

Q: Is the harness wire in good condition?

YES : Go to Step 13.
NO : Repair it. Then go to Step 16.

STEP 13. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 3) and ECM connector B-109 (terminal No. 74).

Q: Is the harness wire in good condition?

YES : Go to Step 14.
NO : Repair it. Then go to Step 16.

STEP 14. Check for harness damage between accelerator pedal position sensor connector C-123 (terminal No. 6) and ECM connector B-109 (terminal No. 77).

Q: Is the harness wire in good condition?

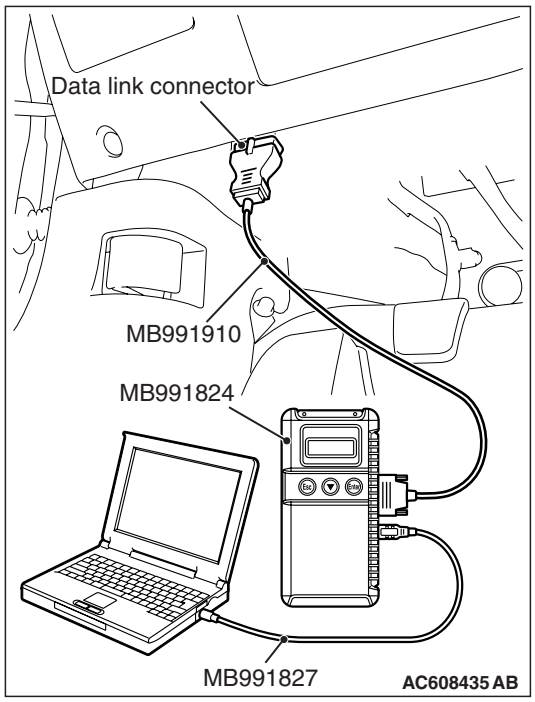
YES : Go to Step 15.
NO : Repair it. Then go to Step 16.

STEP 15. Replace the accelerator pedal position sensor.

(1) Replace the accelerator pedal position sensor.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 16.
NO : The inspection is complete.



STEP 16. Using scan tool MB991958, read the diagnostic trouble code (DTC).

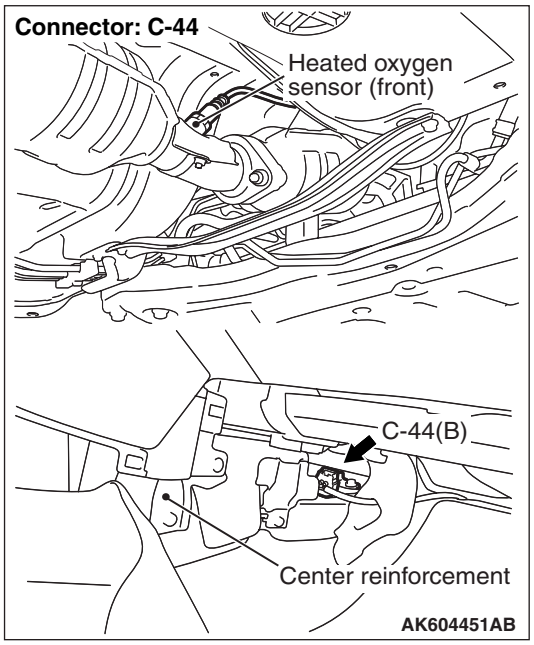
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) After the DTC has been deleted, read the DTC again.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC P2138 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC P2195: Heated Oxygen Sensor (front) Inactive <Except for California>



TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the heated oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P2195 becomes stored in memory if a failure is detected in the heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

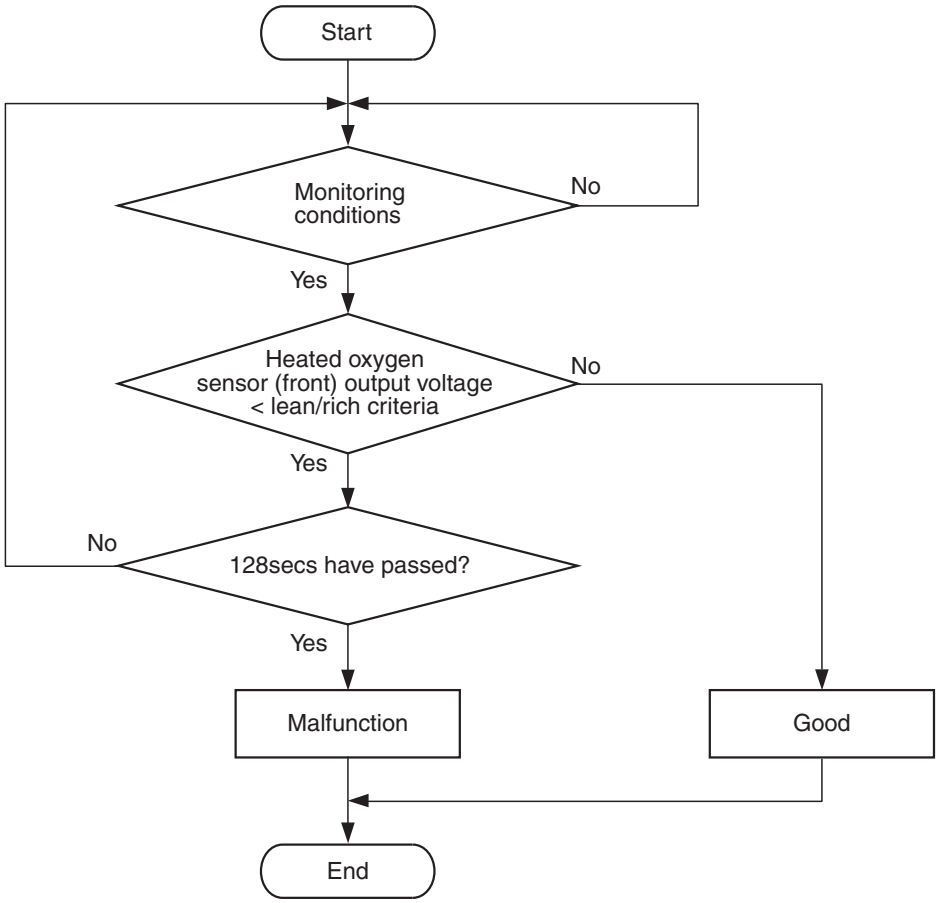
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Heated oxygen sensor (front) heater monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604365

Check Conditions
- More than 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7° C (45° F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than –10° C (14° F).

Judgement Criterion
- Heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- Heated oxygen sensor (front) deteriorated.
- ECM failed.

TSB Revision

DIAGNOSIS

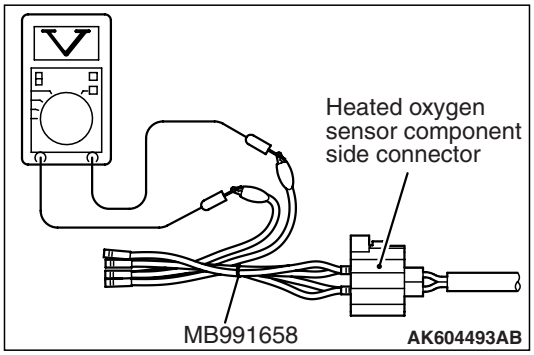
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991658: Test Harness

STEP 1. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector C-29 and connect test harness special tool MB991658 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.
(4) Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V



⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 and the terminal No. 2 of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 2.
NO : Replace the heated oxygen sensor (front). Then go to Step 3.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

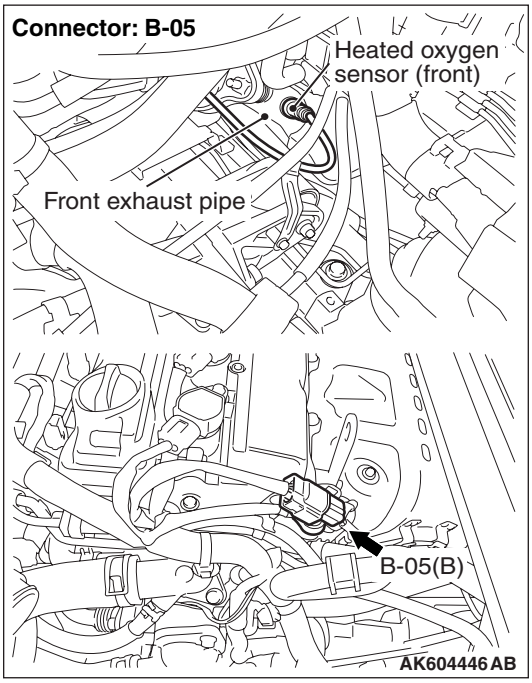
(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2195: Heated Oxygen Sensor (front) Inactive <California>



TECHNICAL DESCRIPTION

- The ECM effects air/fuel ratio feedback control in accordance with the signals from the heated oxygen sensor (front).
- If the heated oxygen sensor (front) has deteriorated, corrections will be made by the heated oxygen sensor (rear).
- DTC P2195 becomes stored in memory if a failure is detected in the heated oxygen sensor (front).

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor (front) output voltage does not cross lean/rich criteria (about 0.5 volt) within specified period.

MONITOR EXECUTION

Continuous

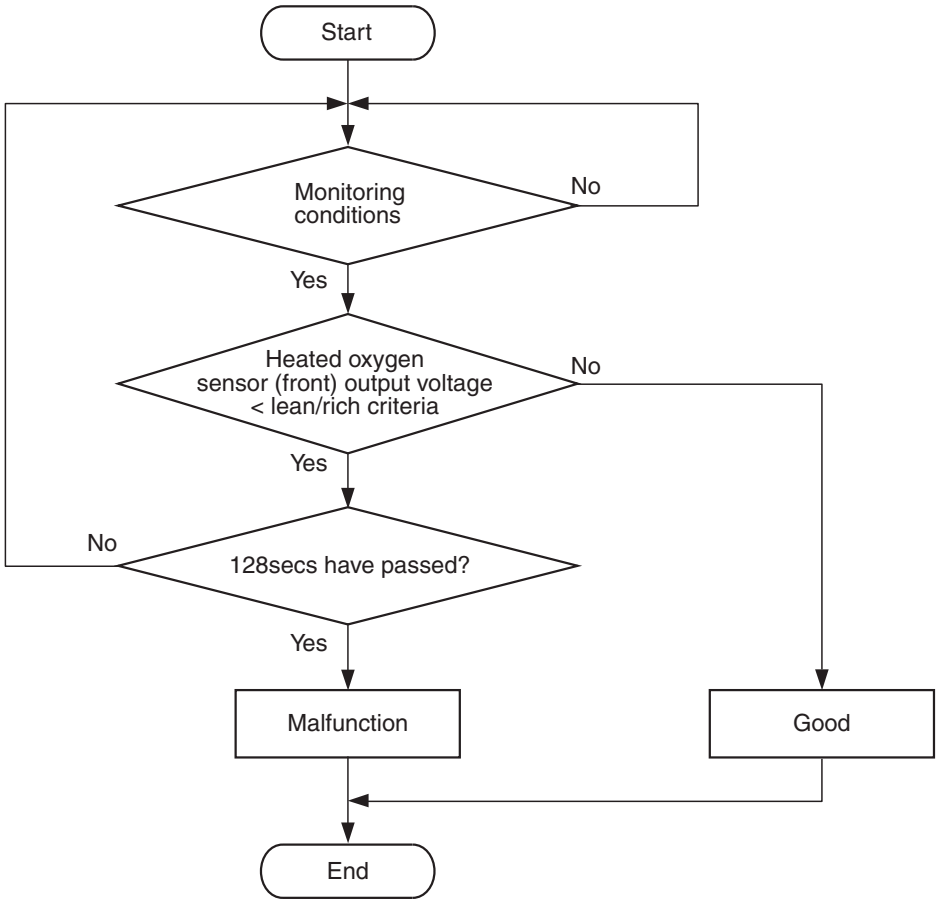
MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Heated oxygen sensor (front) heater monitor
- Misfire monitor

Sensor (The sensor below is determined to be normal)
- Engine coolant temperature sensor
- Intake air temperature sensor

DTC SET CONDITIONS

Logic Flow Chart



AK604365

Check Conditions
- More than 20 seconds or more have passed since the engine starting sequence was completed.
- Engine coolant temperature is higher than 7° C (45° F) or more.
- Under the closed loop air/fuel ratio control.
- Intake air temperature is more than –10° C (14° F).

Judgement Criterion
- Heated oxygen sensor (front) output voltage is less than lean/rich criteria (about 0.5 volt) for 128 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 22 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Heated oxygen sensor (front) deteriorated.
- ECM failed.

TSB Revision

DIAGNOSIS

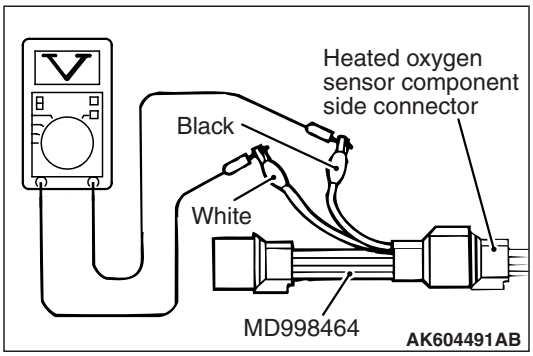
Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MD998464: Test Harness

STEP 1. Check the heated oxygen sensor (front).

(1) Disconnect the heated oxygen sensor (front) connector B-05 and connect test harness special tool MD998464 to the connector on the heated oxygen sensor (front) side.
(2) Warm up the engine until engine coolant temperature reaches 80° C (176° F) or higher.
(3) Rev the engine for 5 minutes or more with the engine speed of 4,500 r/min.
(4) Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
(5) While repeatedly revving the engine, measure the heated oxygen sensor (front) output voltage.

Standard value: 0.6 –1.0 V



⚠ CAUTION

- **Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.**
- **Be careful the heater can be damaged if a voltage beyond 8 volts is applied to the heated oxygen sensor heater.**

NOTE: If the sufficiently high temperature [of approximate 400°C (752°F) or more] is not reached although the heated oxygen sensor is normal, the output voltage would be possibly low although the rich air/fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect the terminal No. 1 (red clip) and the terminal No. 3 (blue clip) of the heated oxygen sensor with the positive terminal and the negative terminal of 8 volts power supply respectively, then check again.

Q: Is the measured voltage between 0.6 and 1.0 volt?

YES : Go to Step 2.
NO : Replace the heated oxygen sensor (front). Then go to Step 3.

STEP 2. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Replace the PCM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Test the OBD-II drive cycle.

(1) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 22 P.13A-10.

(2) Check the diagnostic trouble code (DTC).

Q: Is DTC P2195 set?

YES : Retry the troubleshooting.

NO : The inspection is complete.

DTC P2228: Barometric Pressure Circuit Low Input

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

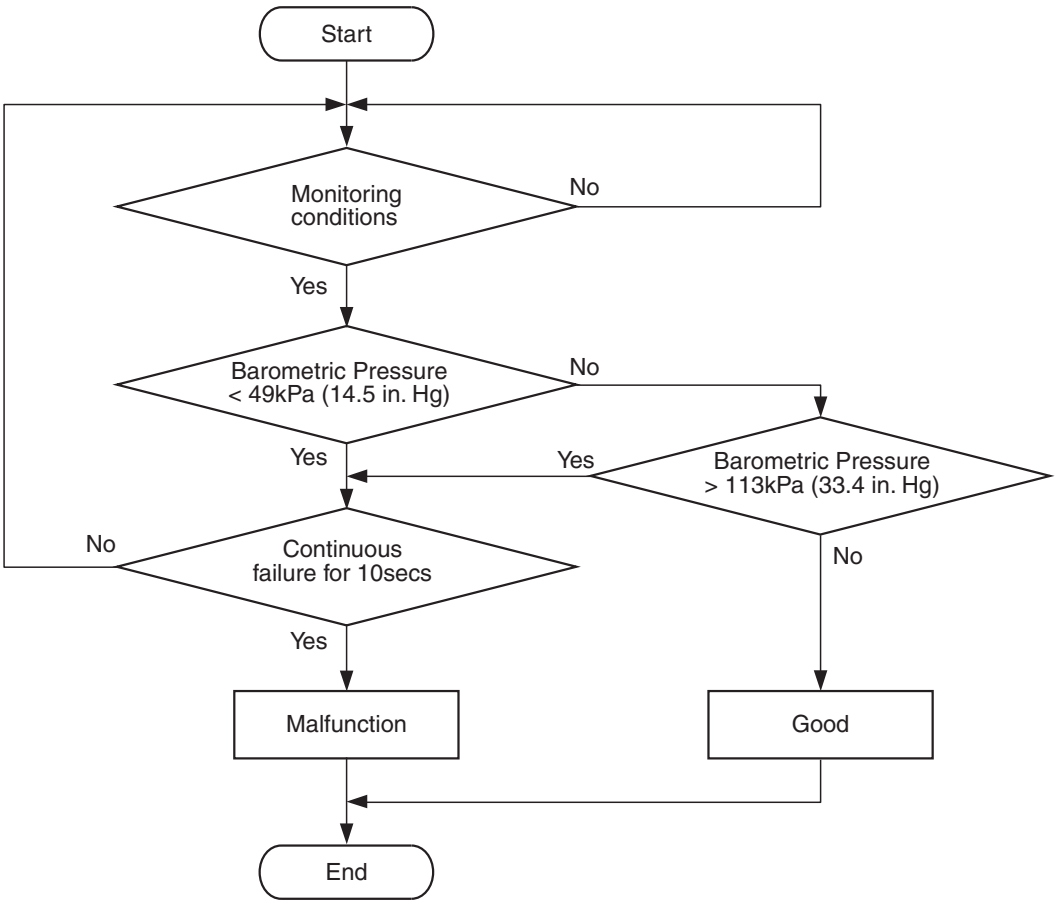
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604366

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 49 kPa (14.5 in.Hg) or lower (approximately 15,000 ft above sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

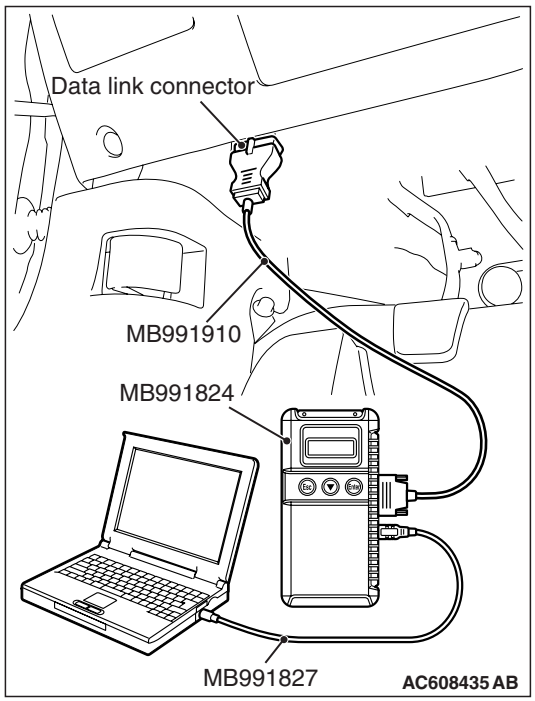
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Test the OBD-II drive cycle.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2228 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P2229: Barometric Pressure Circuit High Input

TECHNICAL DESCRIPTION

- The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure.
- The ECM checks whether this voltage is within a specified range.

DESCRIPTIONS OF MONITOR METHODS

Barometric pressure sensor output voltage is out of reasonable barometric pressure range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

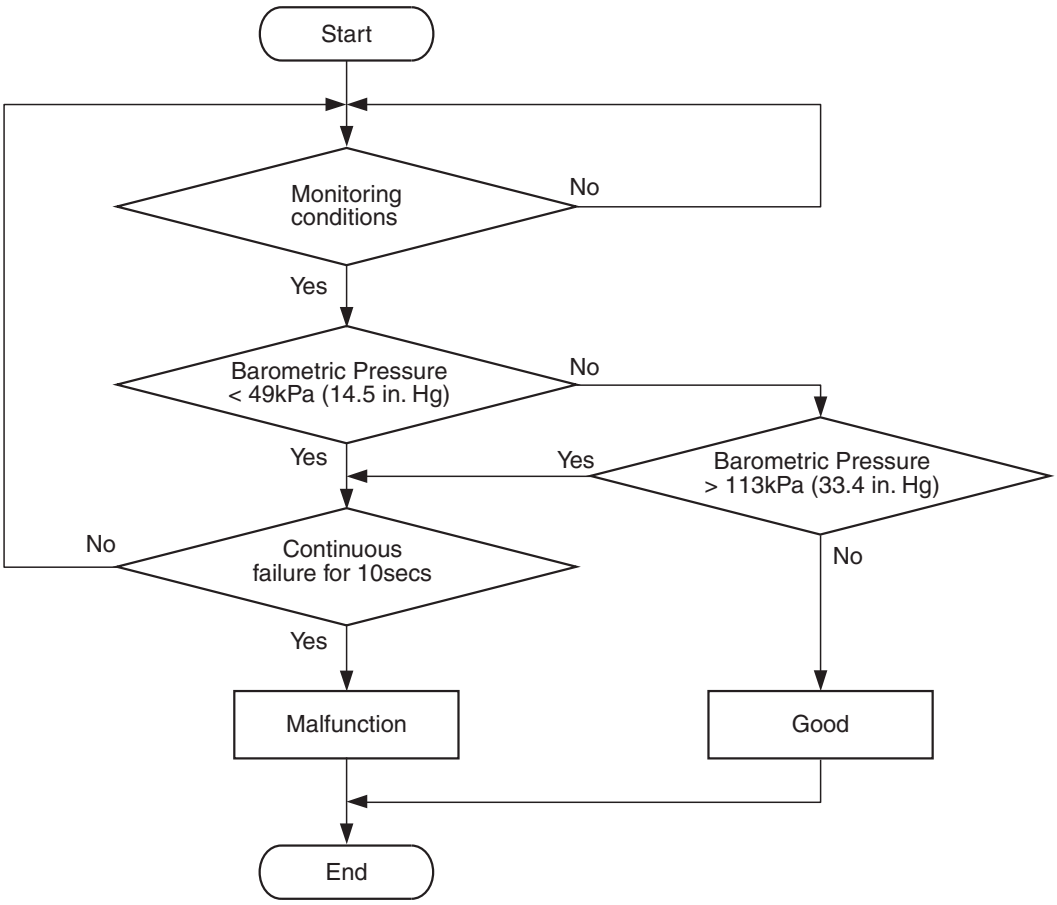
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



AK604366

Check Conditions

- 2 seconds or more have passed since the engine starting sequence was completed.
- Battery positive voltage is higher than 8 volts.

Judgement Criterion

- Barometric pressure sensor output signal has continued to be 113 kPa (33.4 in.Hg) or higher (approximately 4,000 ft below sea level) for 10 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

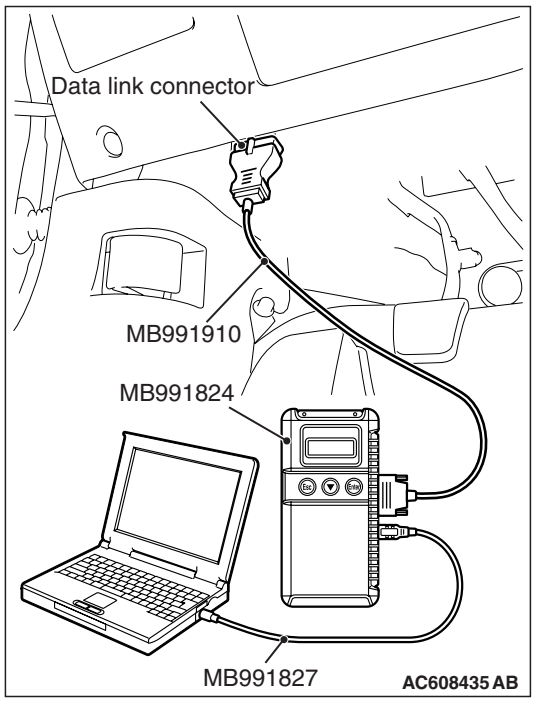
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2229 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P2252: Heated Oxygen Sensor Offset Circuit Low Voltage

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor.
- The ECM checks for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is under specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

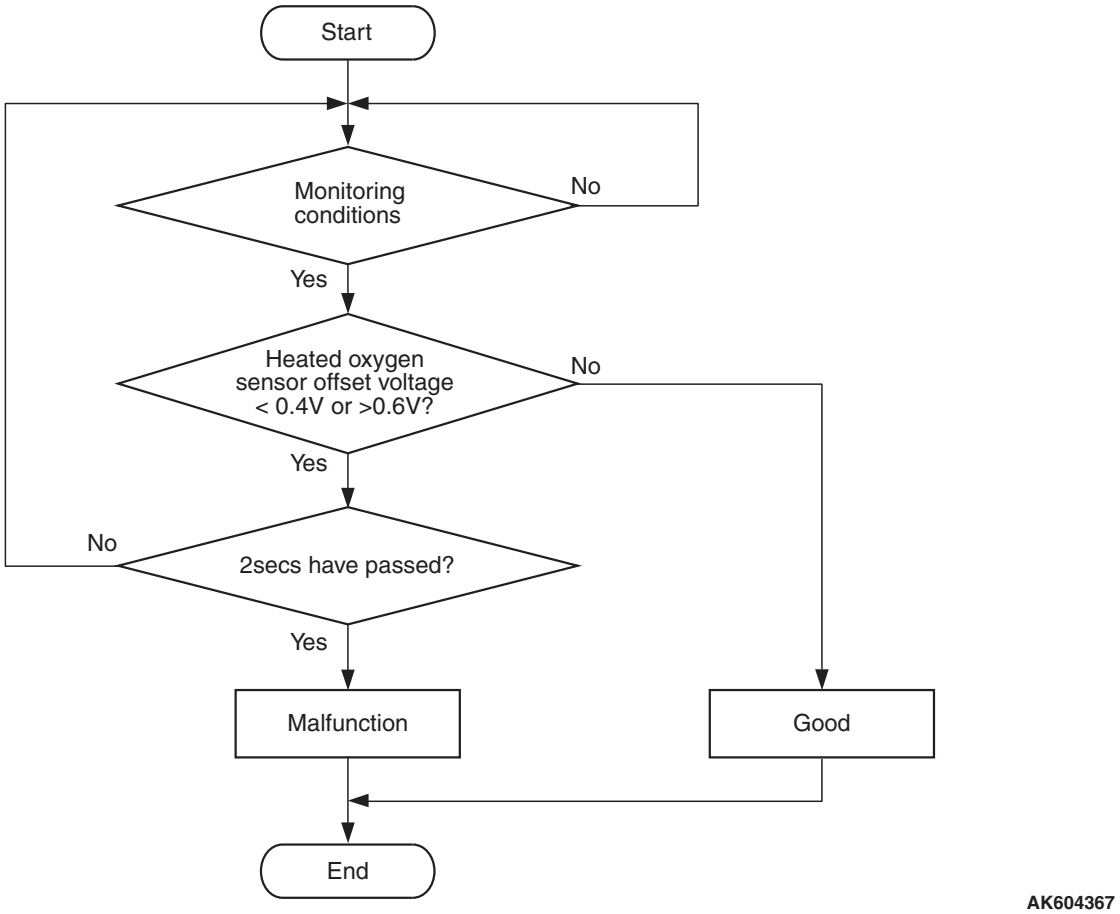
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



AK604367

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor offset voltage has continued to be 0.4 volt or lower for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

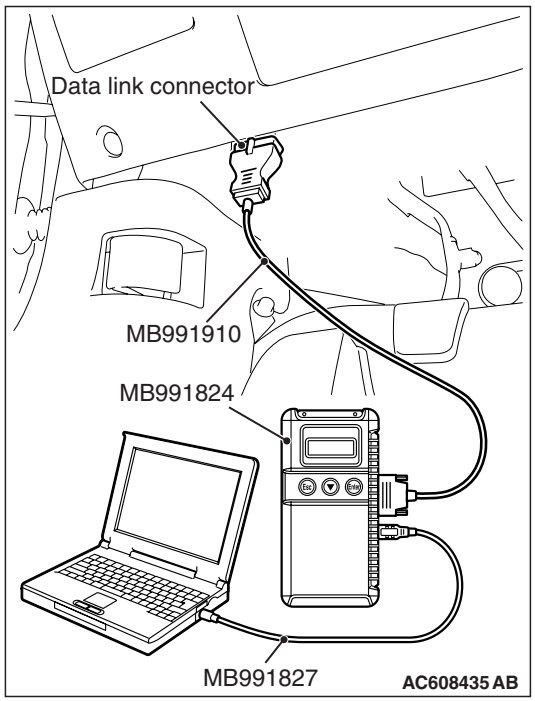
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Carry out the test drive with the drive cycle pattern. Refer to DIagnostic Function –OBD-II Drive Cycle –Pattern 23 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2252 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P2253: Heated Oxygen Sensor Offset Circuit High Voltage

TECHNICAL DESCRIPTION

- The ECM applies an offset voltage of 0.5 volt to the heated oxygen sensor
- The ECM checks for heated oxygen sensor offset voltage.

DESCRIPTIONS OF MONITOR METHODS

Heated oxygen sensor offset voltage is over specified range.

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

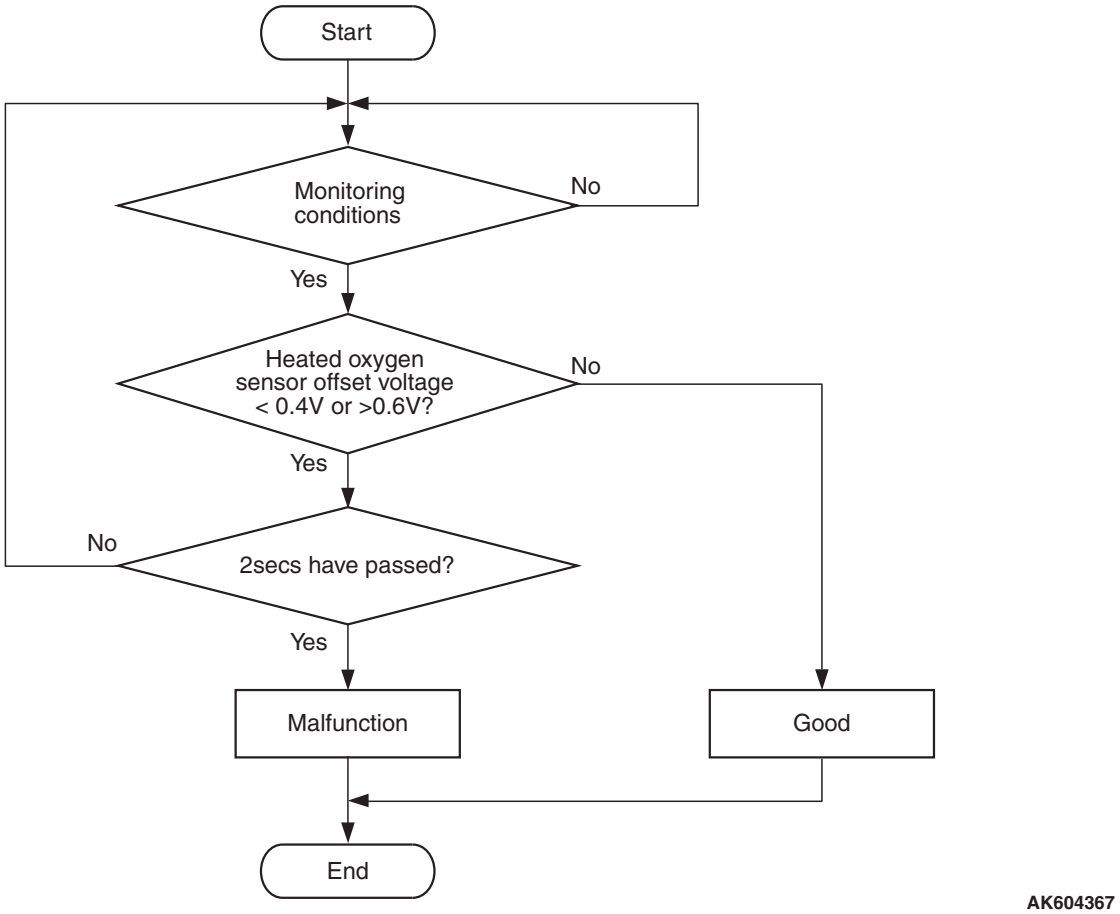
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITION

Logic Flow Chart



AK604367

Check Condition

- 2 seconds or more have passed since the engine starting sequence was completed.

Judgement Criterion

- Heated oxygen sensor offset voltage has continued to be 0.6 volt or higher for 2 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnosis Function –OBD-II Drive Cycle – Pattern 23 P.13A-10.

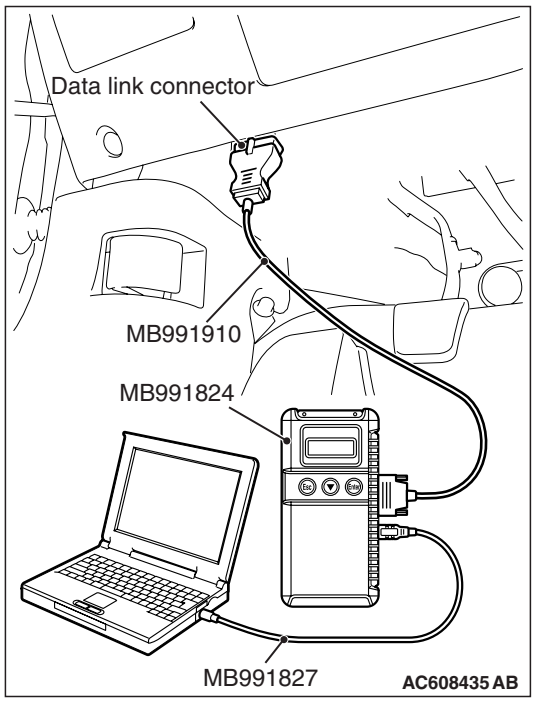
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Test the OBD-II drive cycle.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Carry out the test drive with the drive cycle pattern. Refer to Diagnostic Function OBD-II Drive Cycle –Pattern 23 P.13A-10.
(4) Check the diagnostic trouble code (DTC).

Q: Is DTC P2253 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC P2423: HC adsorber (HC trap catalyst) efficiency below threshold <California>

TECHNICAL DESCRIPTION

After the fuel cut-off during the deceleration, the rich control is performed. Depending on the point of time when the catalyst releases oxygen which is temporarily absorbed by the lean control, the HC adsorber (HC trap catalyst) within center exhaust pipe is judged on its deterioration in performance.

DESCRIPTIONS OF MONITOR METHODS

When the difference in the switching time into the rich control is below the specified time between the heated (rear) oxygen sensor and the heated oxygen sensor (3rd), it is judged that a malfunction exists.

MONITOR EXECUTION

Once per driving cycle

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

- Heated oxygen sensor (front) monitor
- Heated oxygen sensor (rear) monitor
- Heated oxygen sensor (3rd) monitor
- Heated oxygen sensor heater (front) monitor
- Heated oxygen sensor heater (rear) monitor
- Heated oxygen sensor heater (3rd) monitor
- Misfire monitor
- Fuel system monitor
- Air/fuel ratio feedback monitor

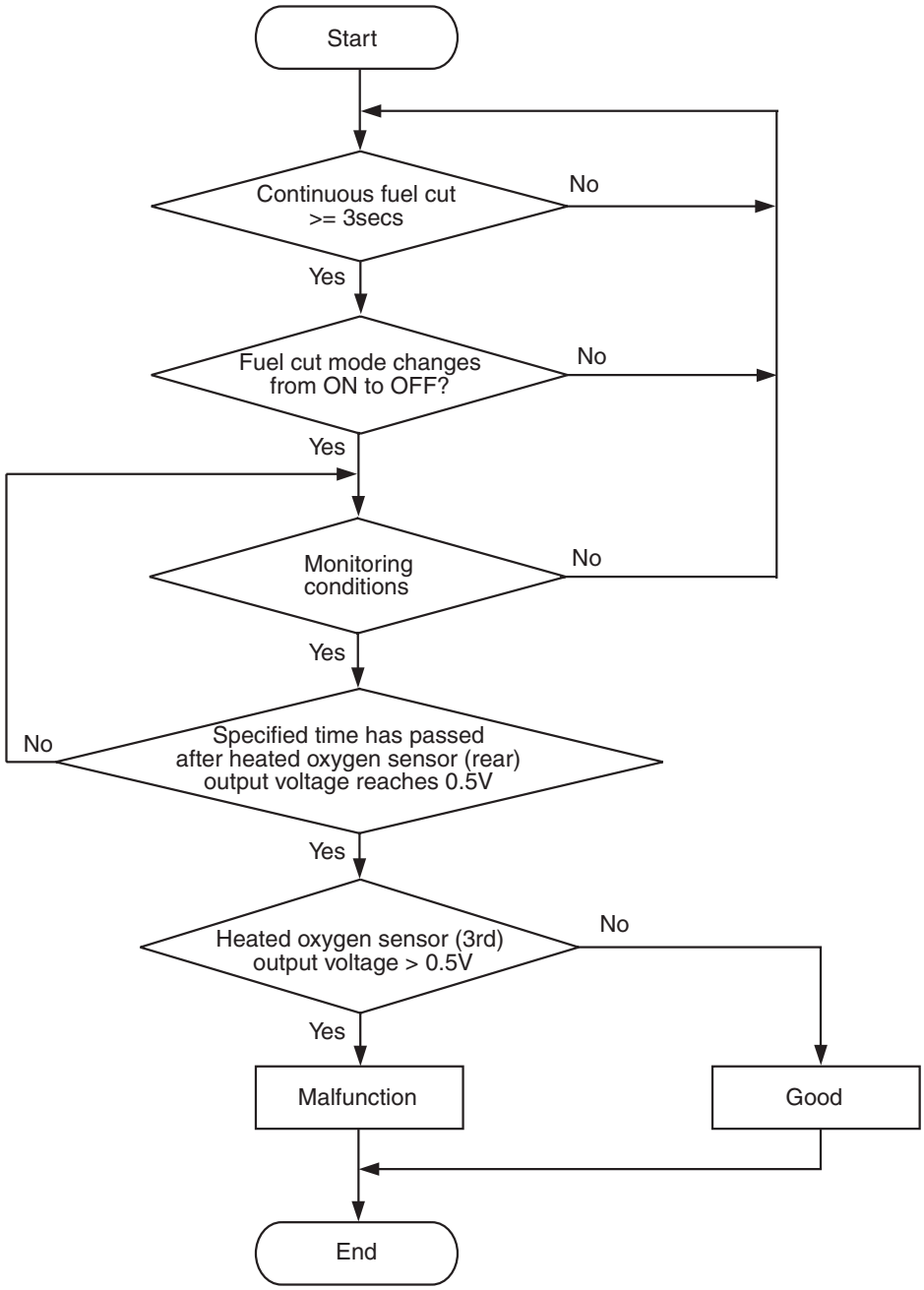
Sensor (The sensor below is determined to be normal)

- Mass airflow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Barometric pressure sensor
- Throttle position sensor
- Accelerator pedal position sensor

TSB Revision

DTC SET CONDITIONS

Logic Flow Chart



AK604368

Check Conditions

- Engine speed is lower than 1,500 r/min <M/T> or 1,313 r/min <CVT>.
- Volumetric efficiency is lower than 25 percent <M/T> or 35 percent <CVT> .
- The throttle valve is closed.
- Barometric pressure is higher than 76 kPa (22.4 in.Hg).
- Intake air temperature is higher than −10° C (14° F).
- The cumulative mass airflow is higher than 2,900 g.

TSB Revision

- The fuel shut-off mode continues for 3 seconds or more.
- After the fuel shut-off mode is terminated, the output voltage of the center exhaust pipe heated oxygen sensor is 0.2 volt or less for 0.5 seconds.

Judgment Criterion

- After the output voltage of the heated oxygen sensor (rear) reaches 0.5 volt, the output voltage of the center exhaust pipe heated oxygen sensor reaches 0.5 volt within 1.5 seconds.

OBD-II DRIVE CYCLE PATTERN

Refer to Diagnostic Function –OBD-II Drive Cycle – Pattern 11 P.13A-10.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- HC trap catalyst deterioration within center exhaust pipe.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Replace the center exhaust pipe.

(1) Replace the center exhaust pipe.
(2) Carry out a test drive with the drive cycle pattern. Refer to Diagnostic Function –OBD-II Drive Cycle –Pattern 11 P.13A-10.
(3) Check the diagnostic trouble code (DTC).

Q: Is DTC P2423 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : The inspection is complete.

DTC U0001: Bus Off

⚠ CAUTION

- **If the ECM output the DTC U0001, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions

- Always

Judgement Criteria

- Bus off error detected

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ECM failed.

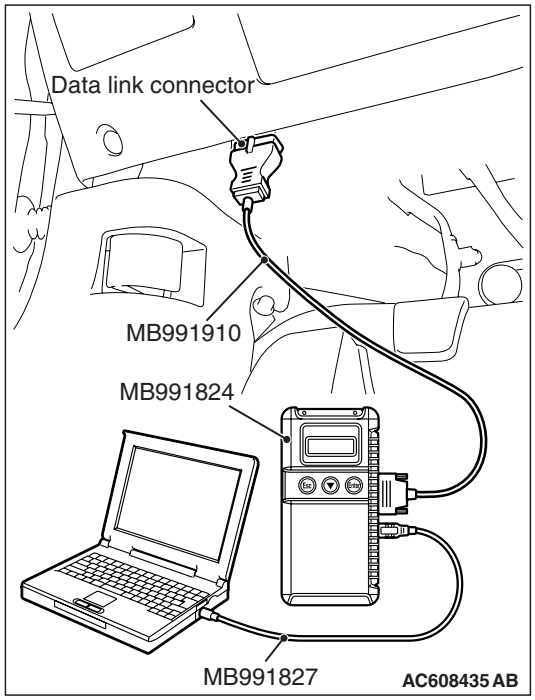
DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable

TSB Revision

- MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting san tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can bus Diagnostics Table P.54C-16. Then go to Step 3.

STEP 2. Recheck for diagnostic trouble code.

Check again if the DTC is set.
(1) Erase the DTC.
(2) Turn the ignition switch to the "ON" position.
(3) Check if the DTC is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0001 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 3.
NO : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 3. Recheck for diagnostic trouble code.
Check again if the DTC is set.
(1) Erase the DTC.
(2) Turn the ignition switch to the "ON" position.
(3) Check if DTC is set.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0001 set?

YES : Replay the troubleshooting.
NO : The inspection is complete.

DTC U0101: Transmission Control Module Time-out

⚠ CAUTION

- **If the ECM output the DTC U0101, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS

There is no data from CVT-ECU for the specified time. (Meter also detect communication error with ECM.)

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

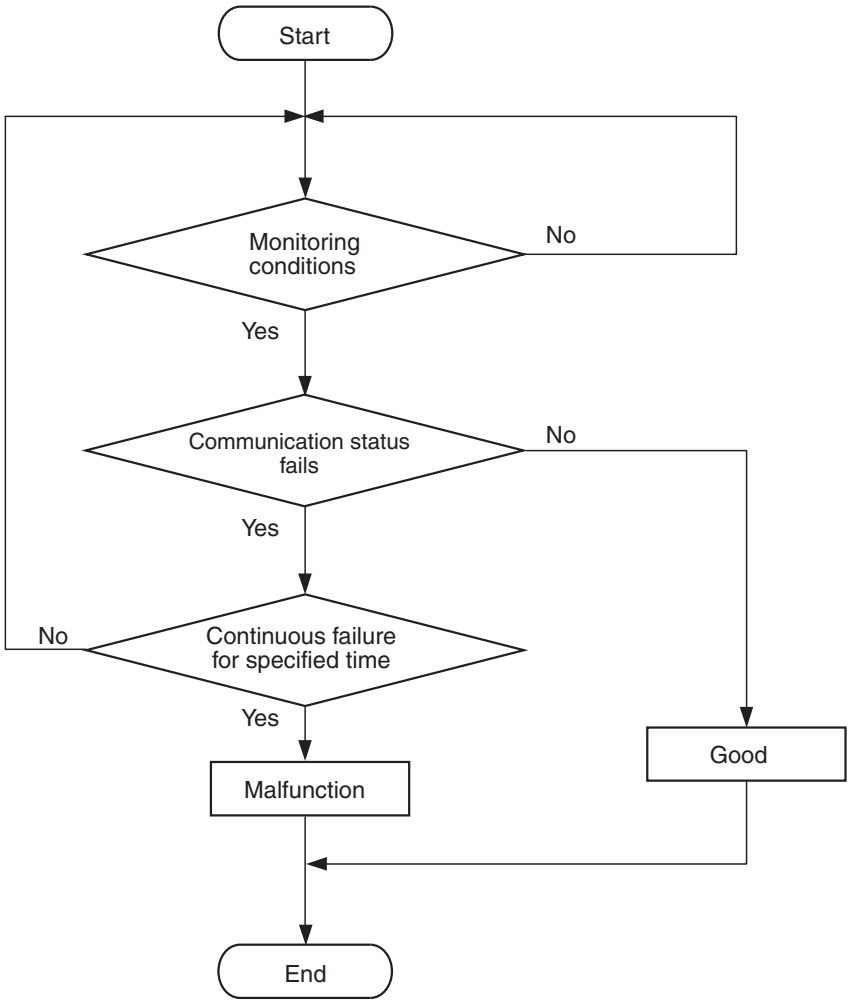
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Lgic Flow Chart



AK604369

Check Condition

- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive CVT-ECU signals through the CAN bus line for 4 seconds.

COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the CVT-ECU on the CAN bus line, a failure in the CVT-ECU power supply system, a failure in the CVT-ECU, or a failure in the ECM.

TSB Revision

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and CVT-ECU, and a failure in the CVT-ECU power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Treat Past Trouble P.00-14).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the M.U.T. –III CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-9).

OBD-II DRIVE CYCLE PATTERN

None.

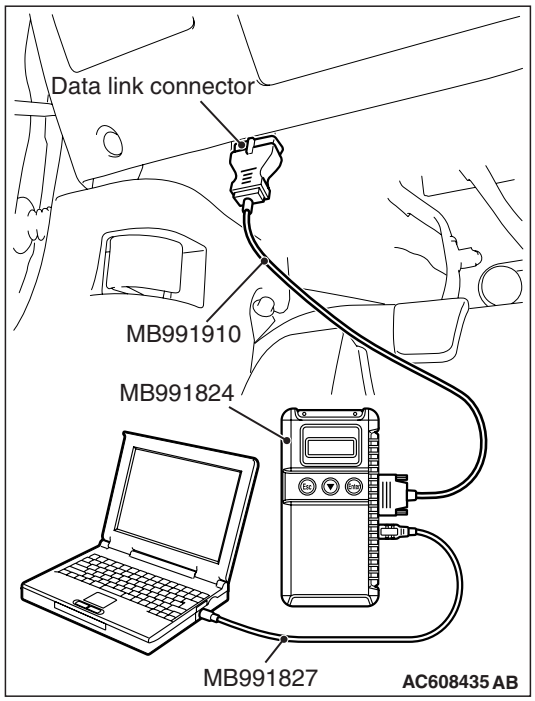
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- CVT-ECU failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the CVT-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CVT-DTC set?

YES : Refer to GROUP 23A, CVT –Diagnostic Trouble Code Chart P.23A-29.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the ABS-DTC and ETACS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Replace the CVT-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and CVT-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and CVT-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

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STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0101 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U0121: ABS-ECU Time-out

⚠ CAUTION
- **If the ECM output the DTC U0121, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions
- Battery positive voltage is 10 volts or higher.
- At least 2 seconds have passed since the ignition switch is turned to "ON" position.

Judgement Criterion
- Unable to receive ABS-ECU signals through the CAN bus line for 4 seconds.

COMMENT

Current Trouble
- Some of the possible causes are a harness or connector damage between the ECM and the ABS-ECU on the CAN bus line, a failure in the ABS-ECU power supply system, a failure in the ABS-ECU, or a failure in the ECM.

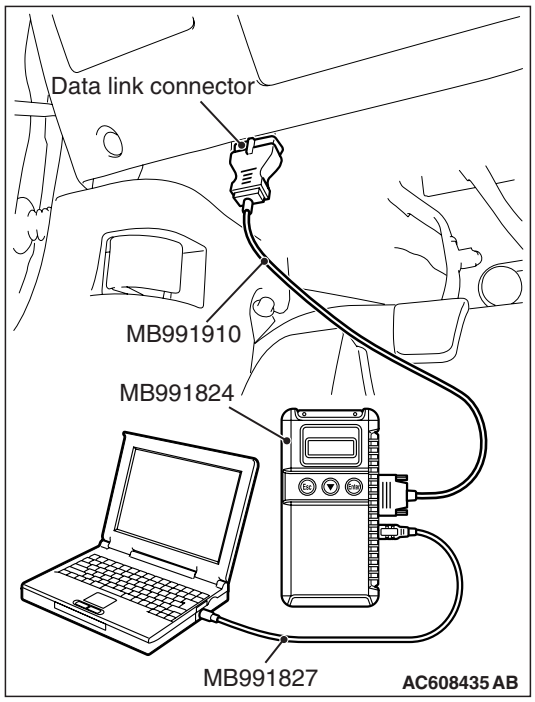
Past Trouble
- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and ABS-ECU, and a failure in the ABS power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Treat Past Trouble P.00-14).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-9).

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)
- CAN line harness damage or connector damage.
- ABS-ECU failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ABS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ABS-DTC set?

YES : Refer to GROUP 35B, Anti-Lock Braking System-Diagnostic Trouble Code Chart P.35B-8.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ETACS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Replace the ABS-ECU. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ABS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Replace he ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ABS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0121 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U0141: ETACS-ECU Time-out

⚠ CAUTION

- **If the ECM output the DTC U0141, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS

There is no data from ETACS-ECU for the specified time. (ETACS-ECU also detect communication error with ECM.)

MONITOR EXECUTION

Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)

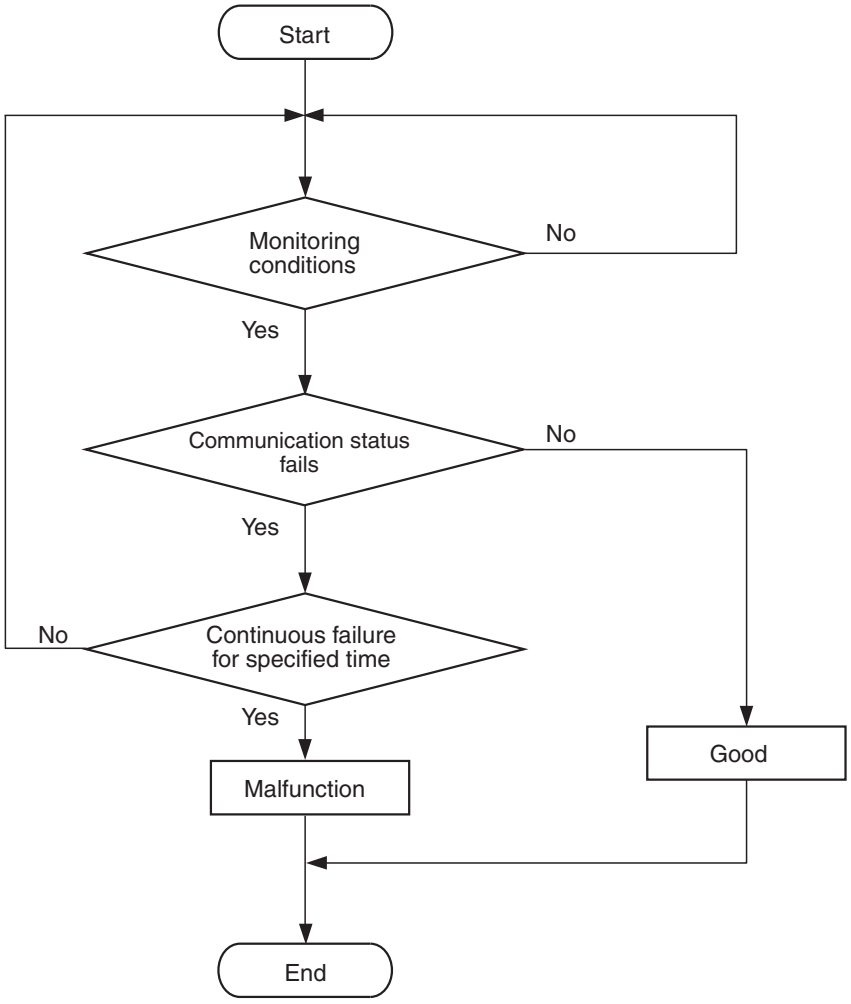
- Not applicable

Sensor (The sensor below is determined to be normal)

- Not applicable

DTC SET CONDITIONS

Logic Flow Chart



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Check Condition

- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive ETACS-ECU signals through the CAN bus line for 4 seconds.

COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the ETACS-ECU on the CAN bus line, a failure in the ETACS-ECU power supply system, a failure in the ETACS-ECU, or a failure in the ECM.

TSB Revision

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and ETACS-ECU, and a failure in the ETACS power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Treat Past Trouble P.00-14).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-9).

OBD-II DRIVE CYCLE PATTERN

None.

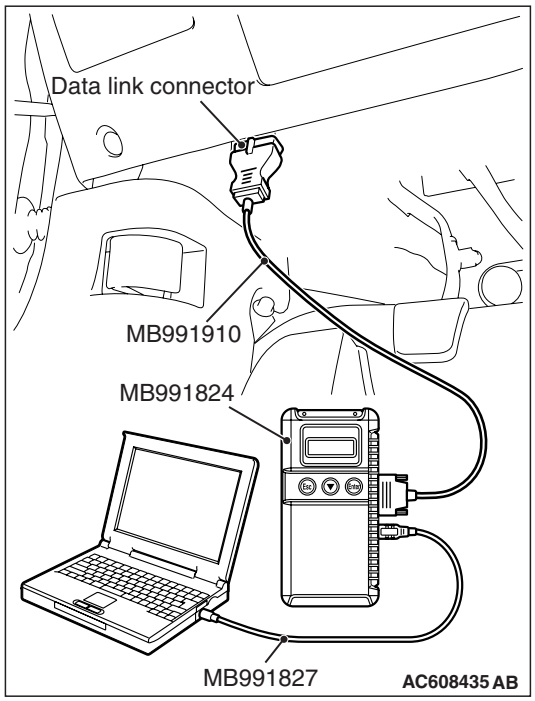
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- ETACS-ECU failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 6.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the ETACS-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the ETACS-DTC set?

YES : Refer to GROUP 54A, ETACS –Diagnostic Trouble Code Chart P.54A-482.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the TCM-DTC, ABS-DTC, KOS-DTC or WCM-DTC, Occupant classification-DTC, Combination meter-DTC, CAN box unit-DTC and A/C-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Go to Step 4.
NO : Go to Step 5.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Replace the ETACS-ECU. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 5. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 6.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and ETACS-ECU. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 6. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0141 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

DTC U0167: KOS-ECU/WCM Communication Error

⚠ CAUTION

- **If the ECM output the DTC U0167, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DTC SET CONDITIONS

Check Conditions

- Ignition switch is in "ON" position.
- Battery positive voltage is 8 volts or higher.

Judgement Criterion

- Unable to receive KOS-ECU/WCM (immobilizer-ECU) signals through the CAN bus line.

COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the KOS-ECU/WCM (immobilizer-ECU) on the CAN bus line, a failure in the KOS-ECU/WCM (immobilizer-ECU) power supply system, a failure in the KOS-ECU/WCM (immobilizer-ECU), or a failure in the ECM.

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and KOS-ECU/WCM (immobilizer-ECU), and a failure in the KOS-ECU/WCM (immobilizer-ECU) power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Treat Past Trouble P.00-14).

TSB Revision

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the MB991958 CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13. Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-9).

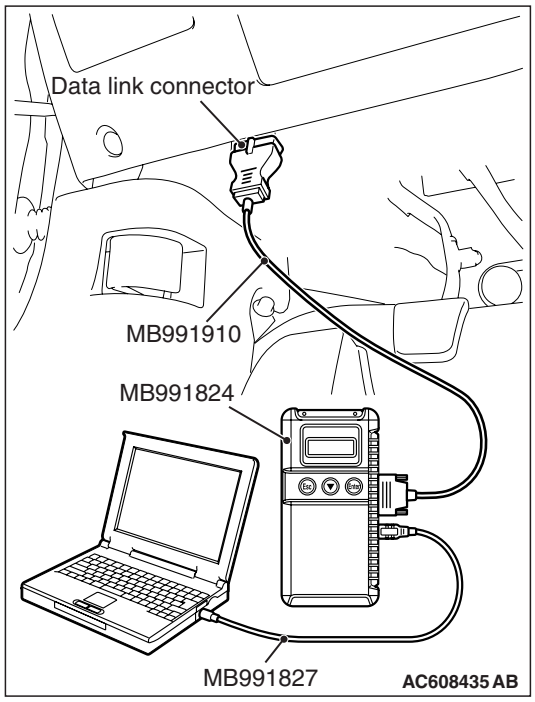
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- KOS-ECU/WCM (immobilizer-ECU) failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 3.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) Read the immobilizer-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the immobilizer-DTC set?

YES : Refer to Refer to GROUP 42B, Keyless Operation System –Diagnosis Trouble Code Chart <Vehicles with KOS> P.42B-20 or GROUP 42C, Wireless Control Module –Diagnosis Trouble Code Chart <Vehicles with WCM> P.42C-14.

NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U0167 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and KOS-ECU/WCM (immobilizer-ECU). Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

DTC U1180: Combination Meter Time-out

⚠ CAUTION
- **If the ECM output the DTC U1180, make sure to diagnose the CAN bus line.**
- **Before replacing the ECU, make sure that the communication circuit is operating normally.**

DESCRIPTIONS OF MONITOR METHODS
There is no data from combination meter for the specified time. (Meter also detect communication error with ECM.)

MONITOR EXECUTION
Continuous

MONITOR EXECUTION CONDITIONS (Other monitor and Sensor)

Other Monitor (There is no temporary DTC stored in memory for the item monitored below)
- Not applicable

Sensor (The sensor below is determined to be normal)
- Not applicable

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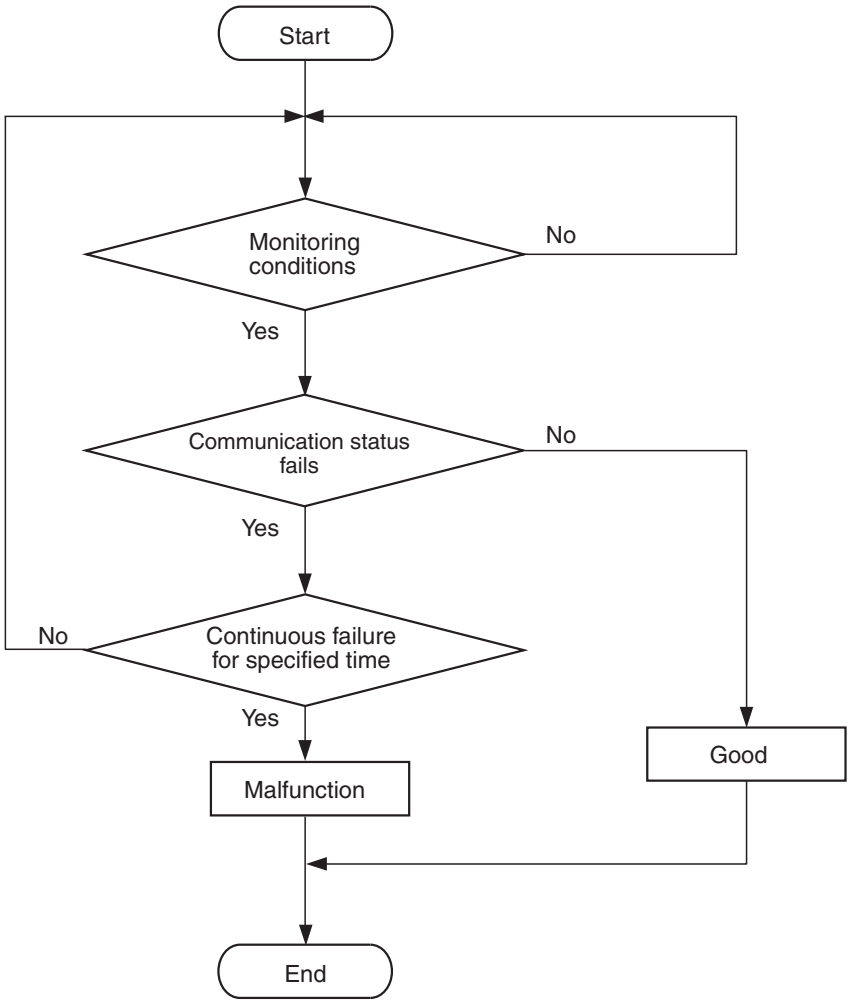
DTC SET CONDITIONS

Lgic Flow Chart



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Check Condition

- Battery positive voltage is between 10 and 16.5 volts.

Judgement Criterion

- Unable to receive combination meter signals through the CAN bus line for 4 seconds.

COMMENT

Current Trouble

- Some of the possible causes are a harness or connector damage between the ECM and the combination meter on the CAN bus line, a failure in the combination meter power supply system, a failure in the combination meter, or a failure in the ECM.

TSB Revision

Past Trouble

- Proceed to troubleshoot based on a harness or connector damage on the CAN bus line between the ECM and combination meter, and a failure in the combination meter power supply system. Refer to "How to cope with past trouble" (Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Treat Past Trouble P.00-14).

NOTE: If a malfunction occurred in the past, a failure cannot be discovered through the M.U.T. –III CAN bus diagnosis even if there might be a problem with the CAN bus. In this case, refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points – How to Cope with Intermittent Malfunctions P.00-13.

Furthermore, it is possible to narrow down the areas of the possible failures from the DTCs that are output by the ECUs, which are communicating on the CAN bus (Refer to GROUP 54C, CAN bus line Diagnostics Flow P.54C-9).

OBD-II DRIVE CYCLE PATTERN

None.

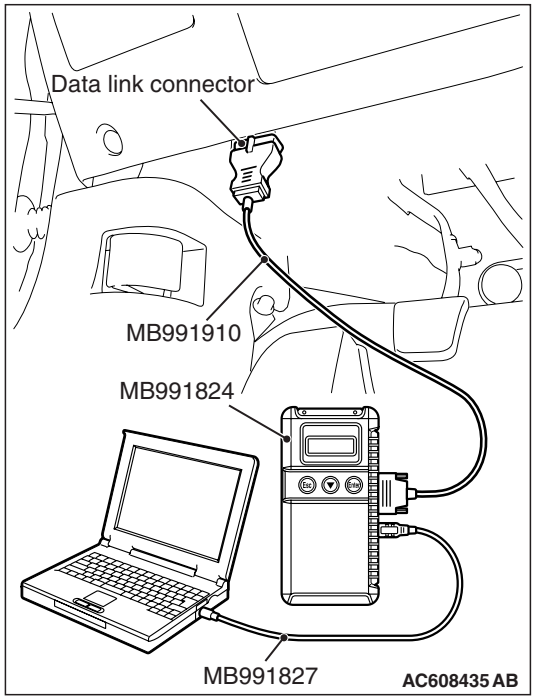
TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- CAN line harness damage or connector damage.
- Combination meter failed.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, diagnose CAN bus line.

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Diagnose CAN bus line.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the CAN bus line normal?

YES : Go to Step 2.
NO : Repair the CAN bus line. Refer to GROUP 54C, Can Bus Diagnostics Table P.54C-16. Then go to Step 4.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) Read the combination meter-DTC.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the combination meter-DTC set?

YES : Refer to GROUP 54A, Chassis Electrical – Combination Meter Assembly –Diagnostic Trouble Code Chart P.54A-23.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, read the diagnostic trouble code (DTC).

(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1180 set?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then go to Step 4.
NO : It can be assumed that this malfunction is intermittent of CAN bus line between ECM and combination meter. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

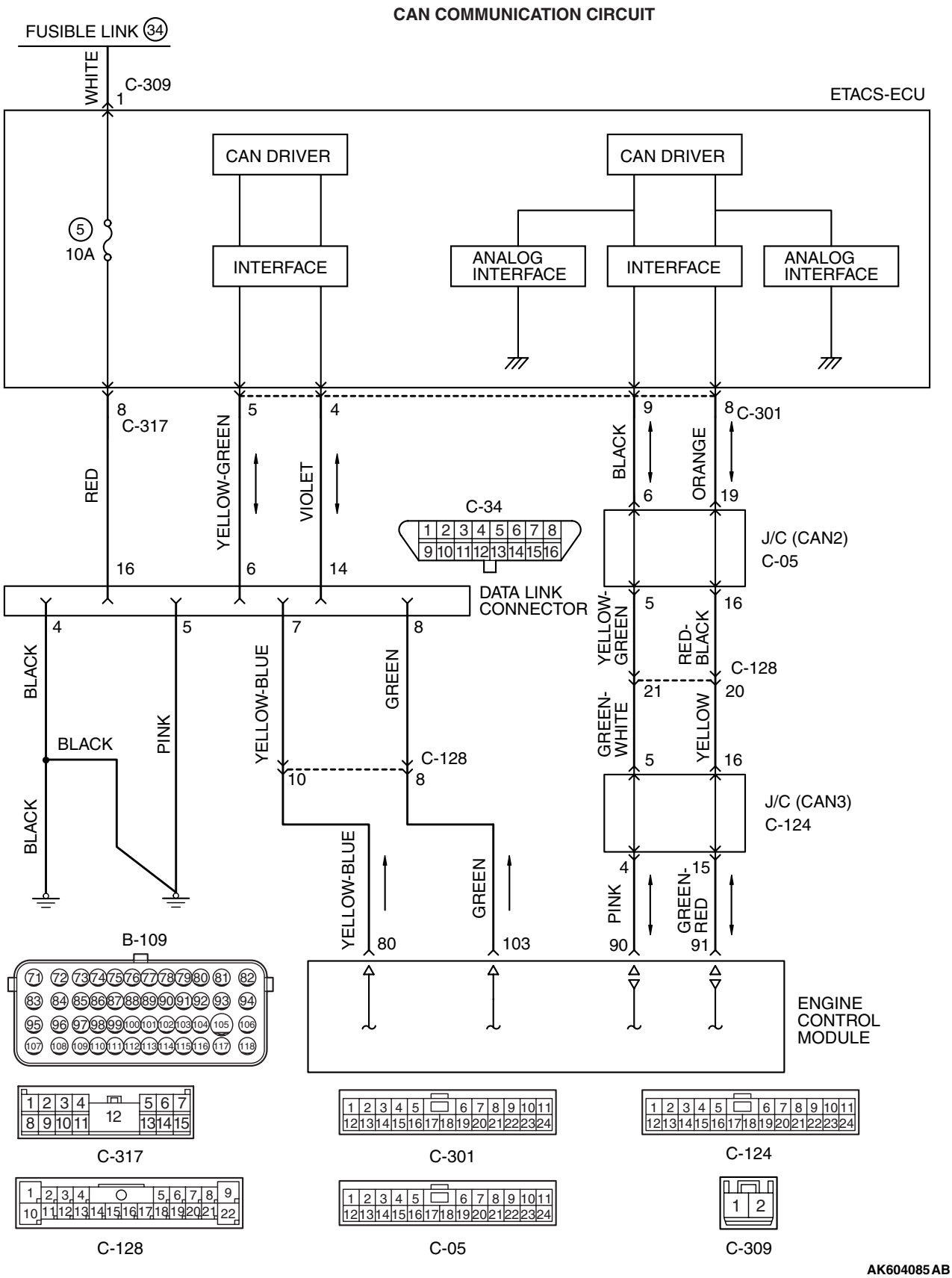
(1) Turn the ignition switch to the "ON" position.
(2) After the MFI-DTC has been deleted, read the MFI-DTC again.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC U1180 set?

YES : Retry the troubleshooting.
NO : The inspection is complete.

SYMPTOM PROCEDURES

Inspection procedure 1: Communication with ECM only is not possible



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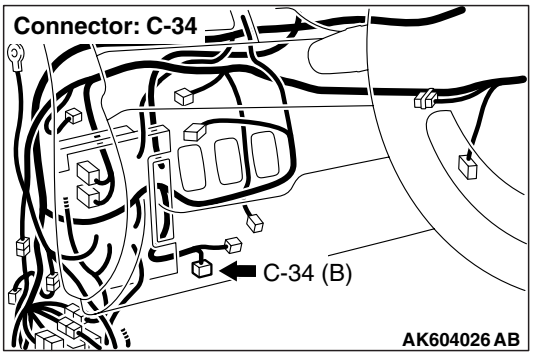
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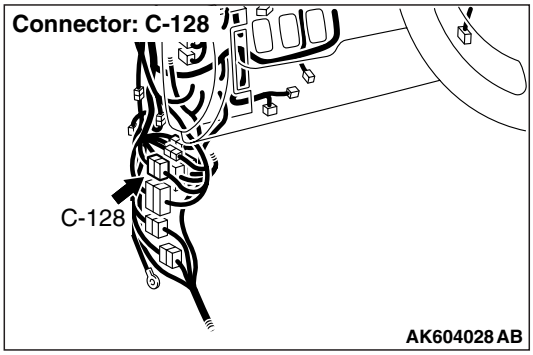
C-34 (B)
AK604026 AB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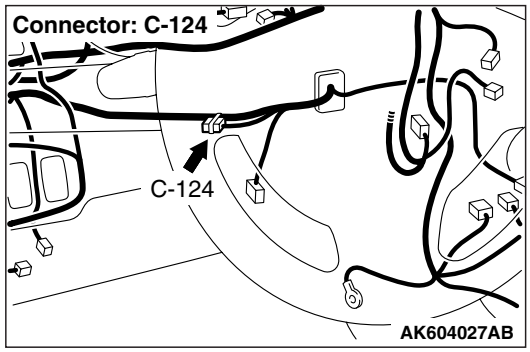
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C-124
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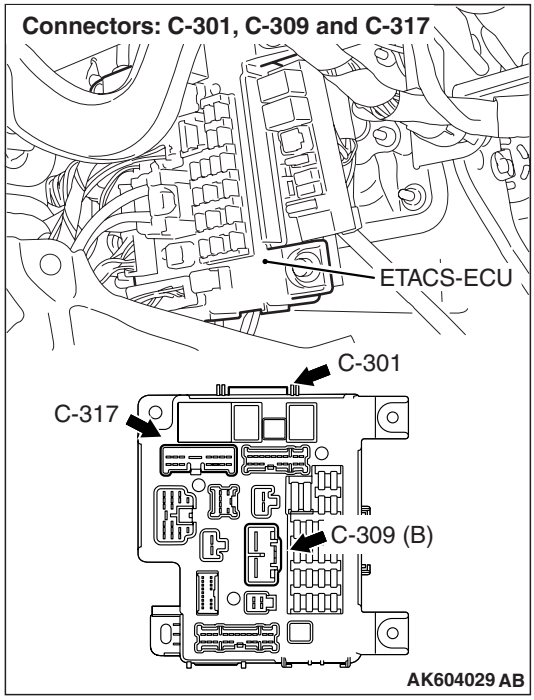
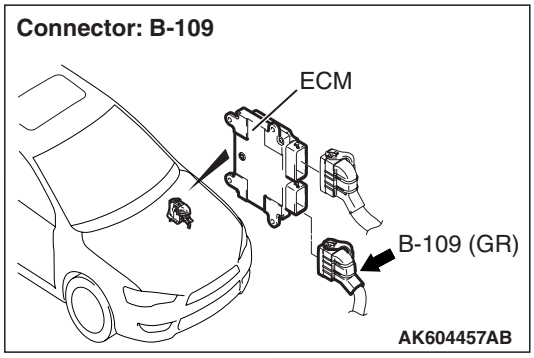

Connectors: C-301, C-309 and C-317
ETACS-ECU
C-301
C-317
C-309 (B)
AK604029 AB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ECM
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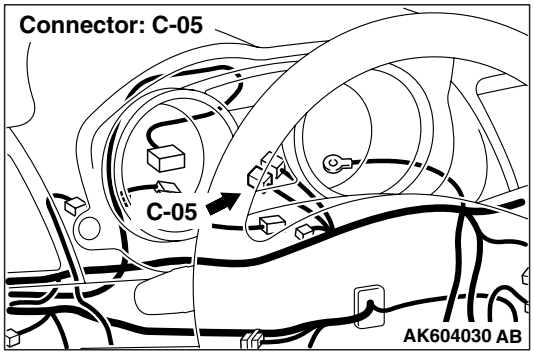

Connector: C-05
C-05
AK604030 AB

CIRCUIT OPERATION

- Battery voltage is applied to the diagnosis connector (terminal No. 16).
- The diagnosis connector (terminal No. 4 and No. 5) is grounded to the vehicle body.

COMMENT

- When the communication between M.U.T.-III and ECM is impossible, it can be suspected that the CAN bus line, power supply circuit of the diagnosis connector, and/or grounding circuit are defective.
- Communication can not be achieved either, if a wrong vehicle type is selected on M.U.T.-III.

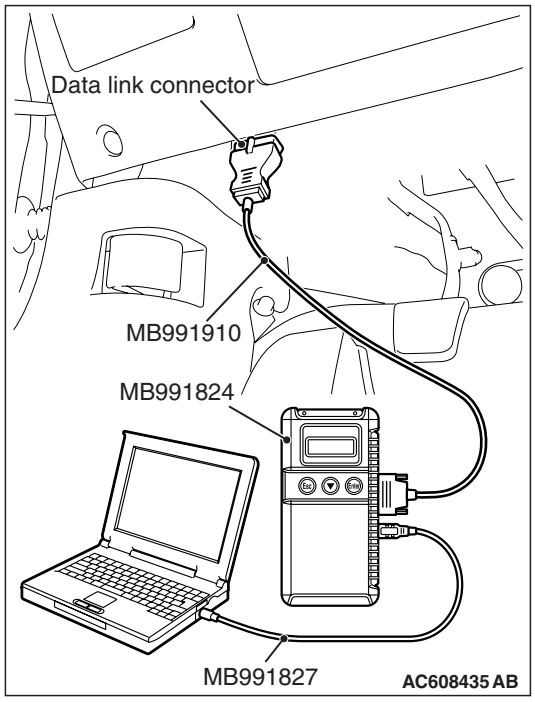
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the data link connector.
- Open/short circuit or poor contact in the data link connector.
- Malfunction of the CAN communication.
- Malfunction of the scan tool.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable



STEP 1. Check the vehicle communication interface (V.C.I.) MB991824 operations.

(1) Connect the Scan tool to the data link connector.
(2) When the power of V.C.I. is turned to ON, the indicator lamp of the V.C.I. illuminates in green.
  - The indicator lamp of the V.C.I. illuminates in green.

Q: Is the indicator lamp of the V.C.I. illuminates in green?

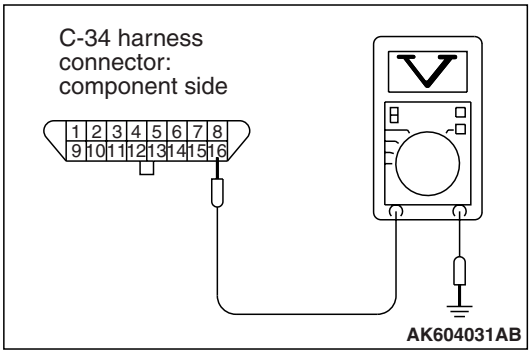
YES : Go to Step 2.
NO : Use scan tool, perform CAN bus line diagnosis.

STEP 2. Measure the battery positive voltage.

(1) Measure the battery positive voltage during cranking.
  - The voltage should be 8 volts or more.

Q: Is the measured voltage 8 volts or more?

YES : Go to Step 3.
NO : Check the battery. Refer to GROUP 54A, Battery – Battery Check P.54A-5. Then confirm that the malfunction symptom is eliminated.



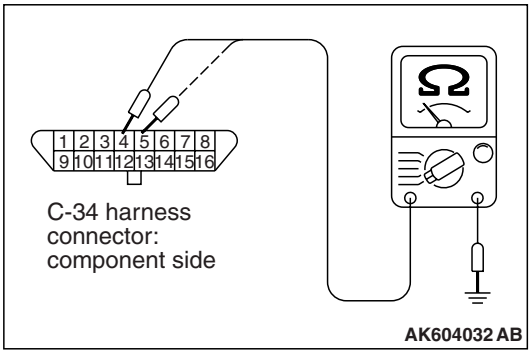
STEP 3. Measure the power supply voltage at data link connector C-34.

(1) Measure voltage between terminal No. 16 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

NO : Repair an open circuit between ETACS-ECU connector C-317 (terminal No. 8) and data link connector C-34 (terminal No. 16). Then confirm that the malfunction symptom is eliminated.



STEP 4. Check the continuity at data link connector C-34.

(1) Check for the continuity between terminal No. 4, No. 5 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Check and replace the scan tool. Then confirm that the malfunction symptom is eliminated.

NO : Repair an open circuit or harness damage between data link connector C-34 (terminal No. 4, No. 5) and ground. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 2: The malfunction indicator lamp (SERVICE ENGINE SOON or check engine lamp) does not illuminate right after the ignition switch is turned to the "ON" position

CIRCUIT OPERATION

- The combination meter causes the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) to illuminate for 20 seconds immediately after the ignition switch is turned to the "ON" position occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp).
- Open or shorted malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

STEP 1. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should illuminate immediately after the ignition switch is turned to the "ON" position.

(2) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) illuminate?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the combination meter.

Inspection procedure 3: The malfunction indicator lamp (SERVICE ENGINE SOON or check engine lamp) remains illuminated and never goes out

COMMENT

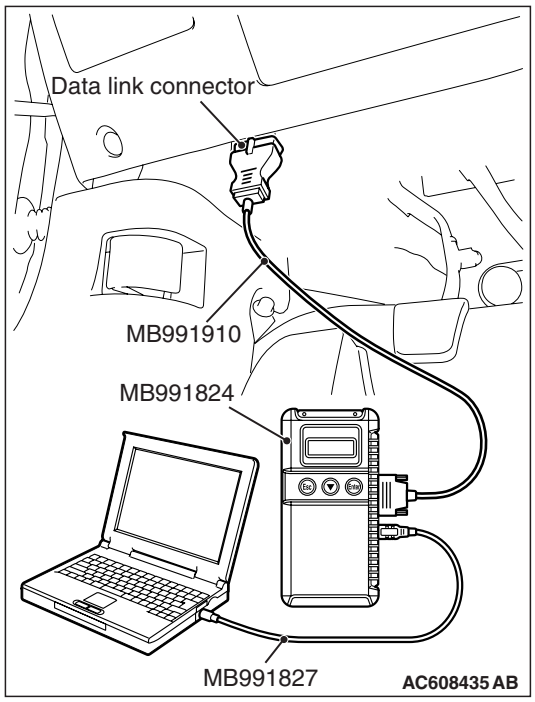
- In cases such as the above, the cause is probably that the ECM is detecting a problem in a sensor or actuator, or that one of the malfunctions listed below has probably occurred.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Short in the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) circuit.

DIAGNOSIS

Required Special Tools:
- Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Check the trouble symptoms.

(1) Turn the ignition switch to the "ON" position.
- The malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) should go out when 20 seconds have passed after the ignition switch was turned to the "ON" position.

(2) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the malfunction indicator lamp (SERVICE ENGINE SOON or Check Engine Lamp) go out?

YES : It can be assumed that this malfunction is intermittent. Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.
NO : Replace the combination meter.

Inspection procedure 4: Cranks, won't start

Cranks, Won't Start Circuit

- Refer to Ignition circuit P.13A-866.

CIRCUIT OPERATION

- Refer to Ignition circuit P.13A-866.

COMMENT

- In cases such as the above, the cause is probably no spark, fuel delivery, or fuel quality problems. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.

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TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the immobilizer system.
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Contaminated fuel.
- Timing chain in out of place.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

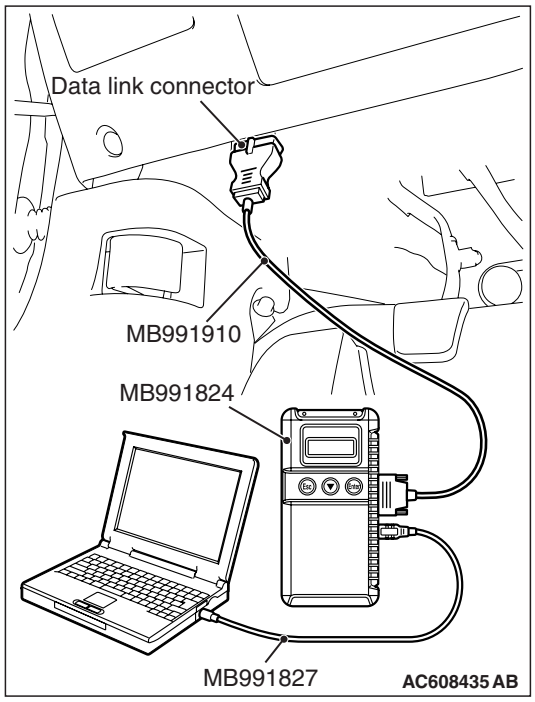
⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position after cranking the engine for at least 2 sec.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC set?

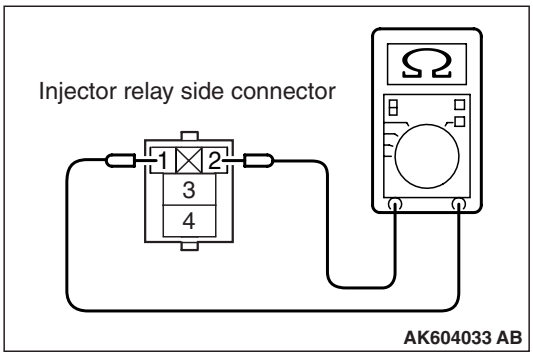
YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.



STEP 2. Check harness connector A-21X at injector relay for damage.

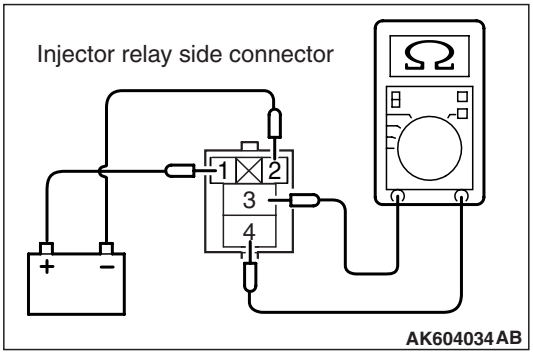
Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 3. Check the injector relay.

(1) Remove the injector relay.
(2) Check for continuity between the injector relay terminals No. 1 and No. 2.
- There should be continuity. (approximately 2 ohms)



(3) Use jumper wires to connect injector relay terminal No. 1 to the positive battery terminal and terminal No. 2 to the negative battery terminal.
(4) Check for continuity between the injector relay terminals No. 3 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

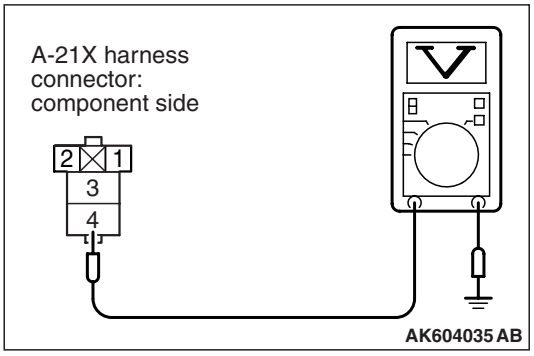
(5) Install the MFI relay.

Q: Is the measured resistance within the specified range?

YES : Go to Step 4.
NO : Replace the injector relay. Then confirm that the malfunction symptom is eliminated.

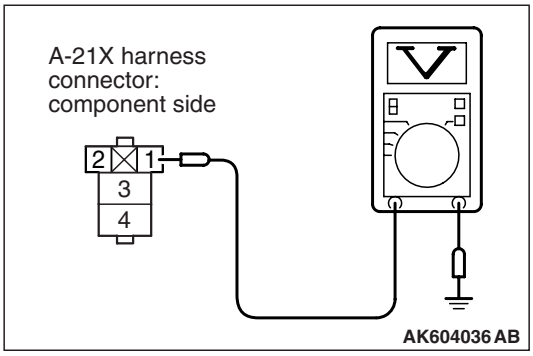
STEP 4. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should measure battery positive voltage.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Repair harness wire between MFI relay connector A-30X (terminal No. 2) and injector relay connector A-21X (terminal No. 4) because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



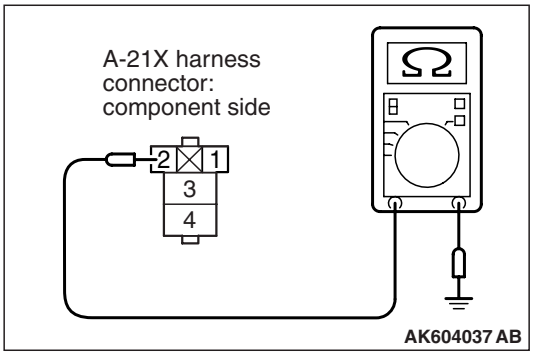
STEP 5. Measure the power supply voltage at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.
NO : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 10) and injector relay connector A-21X (terminal No. 1) because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for continuity at injector relay harness side connector A-21X.

(1) Disconnect the connector A-21X and measure at the harness side.
(2) Check for the continuity between terminal No. 2 and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.
NO : Repair harness wire between injector relay connector A-21X (terminal No. 2) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data List. Refer to Data List Reference Table P.13A-879.
a. Item 01: Power Supply Voltage (at cranking).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 8.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
   a. Item 09: Fuel pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 9.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the fuel pressure.

Refer to Fuel Pressure Test P.13A-929.

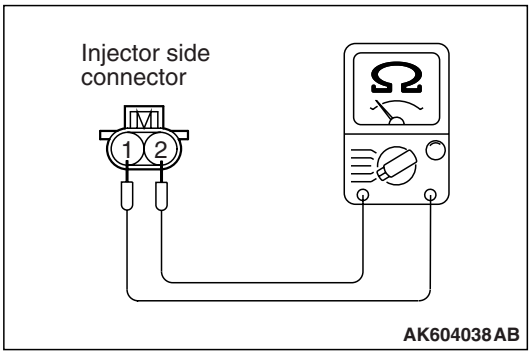
Q: Is the fuel pressure normal?

YES : Go to Step 10.
NO : Check the following items, and repair or replace the defective items.
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

STEP 10. Check the injector resistance.

(1) Disconnect the injector connector B-101, B-102, B-103, B-104.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]



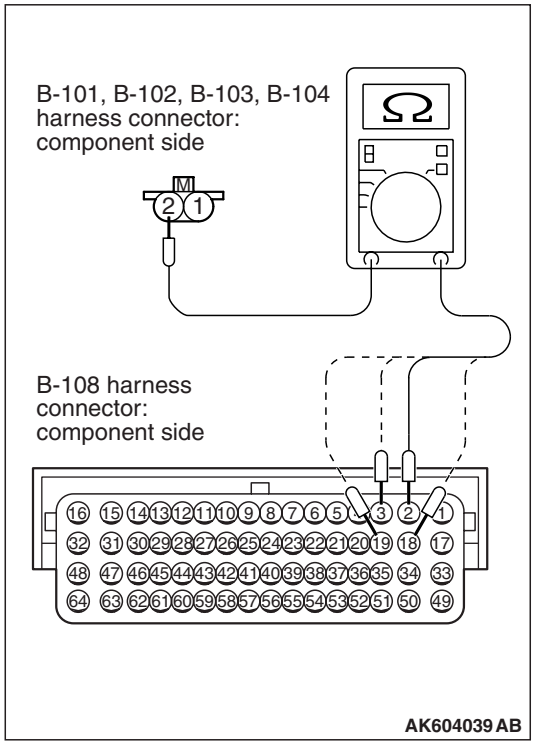
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 11.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check harness connector B-108 at ECM and harness connector B-101, B-102, B-103, B-104 at left bank injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 12.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 12. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.
(2) Measure the resistance between injector connector and ECM connector.
   a. Injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) at No. 1 cylinder injector.
   b. Injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3) at No. 2 cylinder injector.
   c. Injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) at No. 3 cylinder injector.
   d. Injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) at No. 4 cylinder injector.
      - Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 13.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check the ignition system.

(1) Connect the timing light to terminal No. 1 of the ignition coil connector B-01, B-02, B-03 or B-04 in order.
(2) Crank the engine.
   - The timing light flashes.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the timing light flash?

YES : Go to Step 14.
NO : Refer to inspection procedure 25 –Ignition circuit system P.13A-866.

STEP 14. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 15.

STEP 15. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 16.

STEP 16. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?
YES : Go to Step 17.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 17. Check the ignition timing.
(1) Check the ignition timing at cranking.
Standard value: 5° BTDC ±3°

Q: Is the ignition timing normal?
YES : Check the following items, and repair or replace the defective items.
a. Check if the injectors are clogged.
b. Check if fuel is contaminated.
Then confirm that the malfunction symptom is eliminated.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 5: Starts up and dies

COMMENT
- In such cases as the above, the cause is usually improper air/fuel mixture. It is possible, though less likely, that the spark plugs are generating sparks but the sparks are weak.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression.
- Malfunction of the EGR system <California>.
- Contaminated fuel.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?

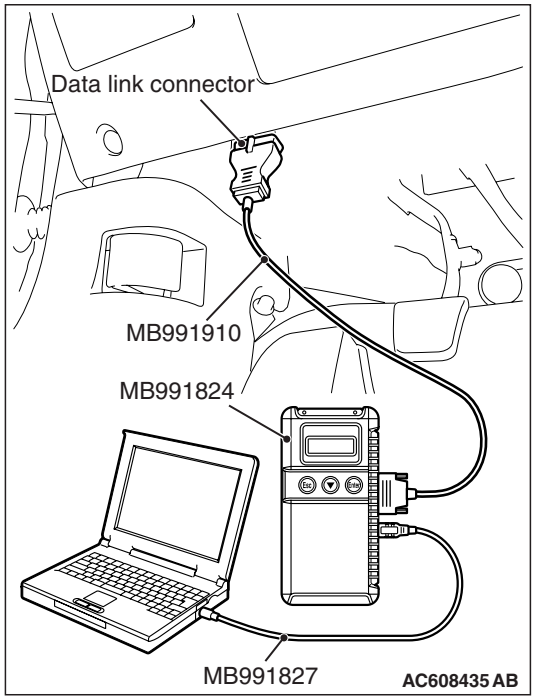
YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.

NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 06: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
   a. Item 01: Power Supply Voltage (at Cranking)
   b. Item 09: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ±3°

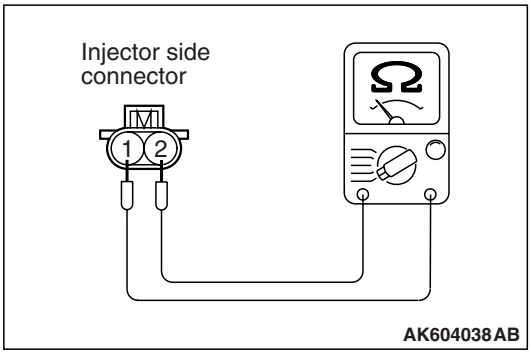
Q: Is the ignition timing normal?

YES : Go to Step 6.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the left bank injector resistance.

(1) Disconnect the left bank injector connector B-101, B-102, B-103, B-104.
(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]



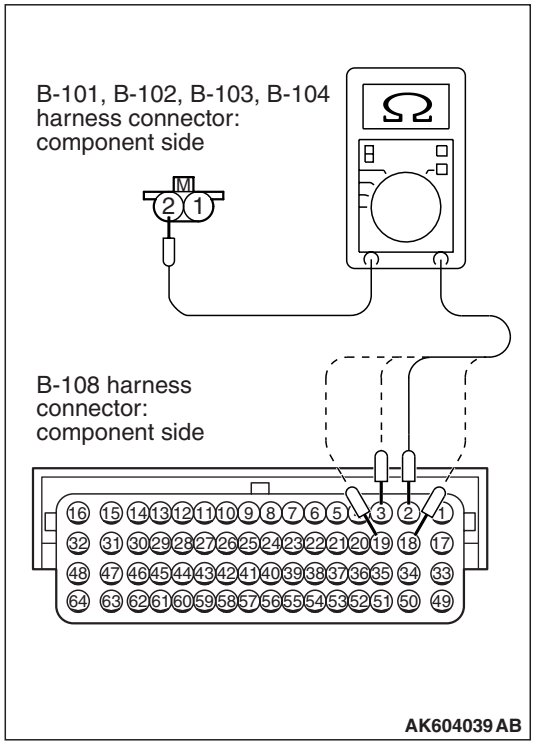
Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 7.
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check harness connector B-101, B-102, B-103, B-104 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 8.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2.Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.
(2) Measure the resistance between injector connector and ECM connector.
   a. Injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) at No. 1 cylinder injector.
   b. Injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3) at No. 2 cylinder injector.
   c. Injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) at No. 3 cylinder injector.
   d. Injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) at No. 4 cylinder injector.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 9.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ±3°

Q: Is the ignition timing normal?

YES : Go to Step 10.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 11.

STEP 11. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 12.

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STEP 12. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?

YES : Check the following items, and repair or replace the defective items.
a. Check fuel lines for clogging.
b. Check if fuel is contaminated.
c. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 6: Hard starting

COMMENT

- In cases such as the above, the cause is usually either weak spark, improper air-fuel mixture or low compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the EGR system <California>
- Contaminated fuel.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

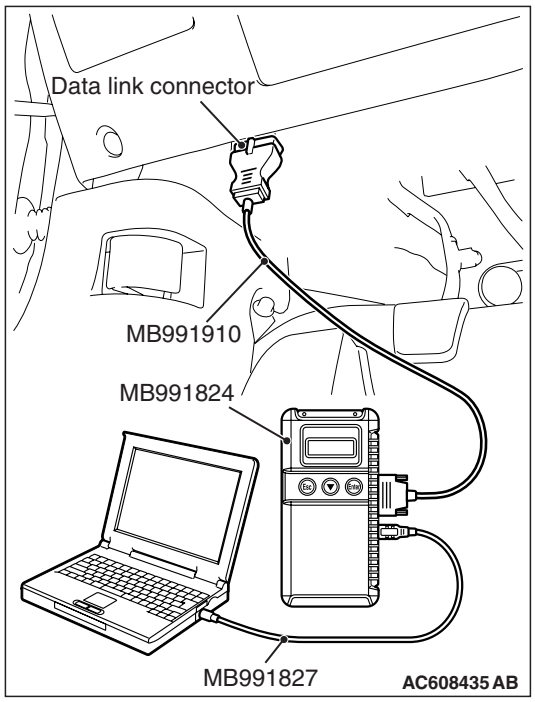
STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.

NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check data list.

(1) Turn the ignition switch the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 01: Power Supply Voltage (at Cranking)
   b. Item 06: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 4.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
   a. Item 09: Fuel Pump.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or Replace. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.

(1) Check the ignition timing at cranking.

Standard value: 5° BTDC ±3°

Q: Is the ignition timing normal?

YES : Go to Step 6.

NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.

Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 7.

NO : Check the following items, and repair or replace the defective items.

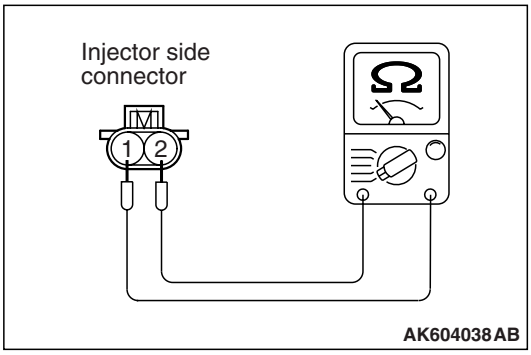
- Insufficient fuel pump discharge.
- Fuel pump filter clogged.

STEP 7. Check the injector resistance.

(1) Disconnect the left bank injector connector B-101, B-102, B-103, B-104.

(2) Measure the resistance between each injector side connector terminal No. 1 and No. 2.

Standard value: 10.5 –13.5 Ω [at 20° C (68° F)]



Q: Is the measured resistance between 10.5 and 13.5 ohms [at 20° C (68° F)]?

YES : Go to Step 8.

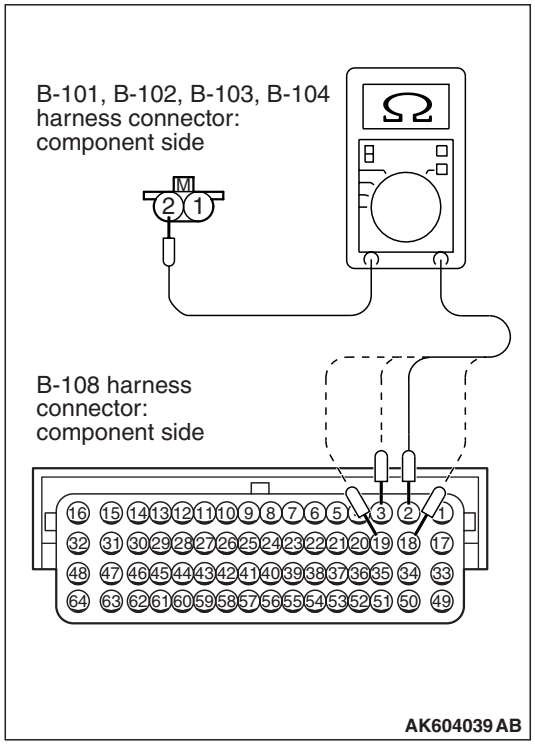
NO : Replace the faulty injector. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check harness connector B-108 at ECM and harness connector B-101, B-102, B-103, B-104 at injector for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check for harness damage between injector connector and ECM connector.

(1) Disconnect the injector connector and ECM connector.
(2) Measure the resistance between injector connector and ECM connector.
   a. Injector connector B-101 (terminal No. 2) and ECM connector B-108 (terminal No. 2) at No. 1 cylinder injector.
   b. Injector connector B-102 (terminal No. 2) and ECM connector B-108 (terminal No. 3) at No. 2 cylinder injector.
   c. Injector connector B-103 (terminal No. 2) and ECM connector B-108 (terminal No. 18) at No. 3 cylinder injector.
   d. Injector connector B-104 (terminal No. 2) and ECM connector B-108 (terminal No. 19) at No. 4 cylinder injector.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the ignition system.

(1) Connect the timing light to terminal No. 3 of the ignition coil connector B-01, B-02, B-03 or B-04 in order.
(2) Crank the engine.
   • The timing light flashes.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Does the timing light flash?

YES : Go to Step 11.
NO : Refer to Inspection procedure 25 –Ignition circuit system P.13A-866.

STEP 11. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 12.

STEP 12. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 13.

STEP 13. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?
YES : Check the following items, and repair or replace the defective items.
a. Check if fuel is contaminated.
b. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 7: Unstable idle (rough idle, hunting)

COMMENT
- In cases such as the above, the cause is probably the air/fuel mixture. Other systems affecting idle quality include the ignition system and compression.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Malfunction of the injector system.
- Poor compression
- Malfunction of the purge control system
- Malfunction of the EGR system <California>
- Improper operation of the PCV valve.
- Malfunction of the charging system.
- Vacuum leak.
- Contaminated fuel.
- Malfunction of variable valve timing control (MIVEC) system.
- Malfunction of the ECM.

DIAGNOSIS
Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
  - MB992110: Power Plant ECU Check Harness

STEP 1. Check if the EGR valve sounds during initialization.

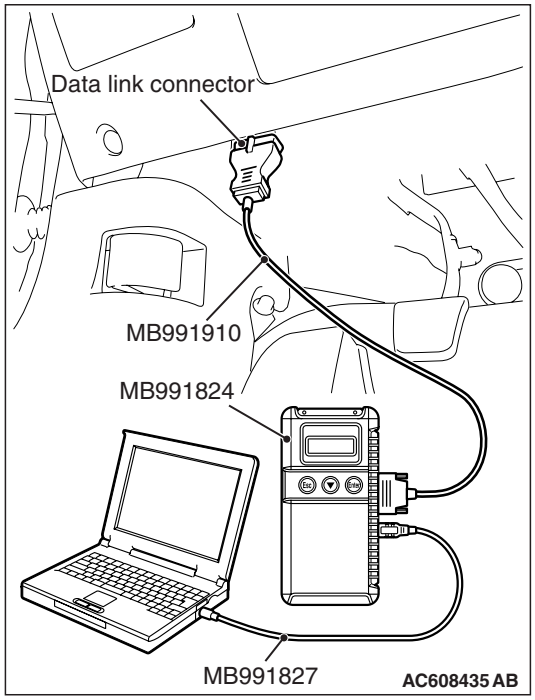
NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC)

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch is to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
  a. Item 01: Injector.
  b. Item 10: Evaporative emission purge solenoid
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 05: Intake Air Temperature Sensor.
   b. Item 06: Engine Coolant Temperature Sensor.
   c. Item 10: Mass Airflow Sensor
   d. Item 76: A/C Switch
   e. Item 36: Intake MIVEC phase angle
   f. Item 39: Exhaust MIVEC phase angle
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pressure.

Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

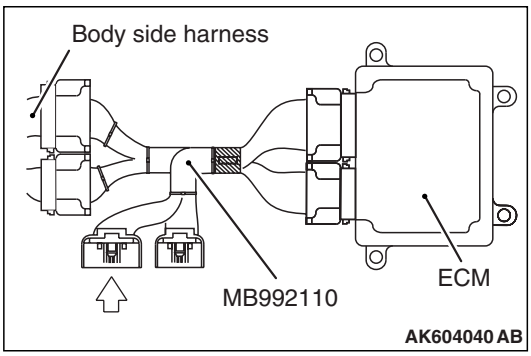
STEP 6. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?

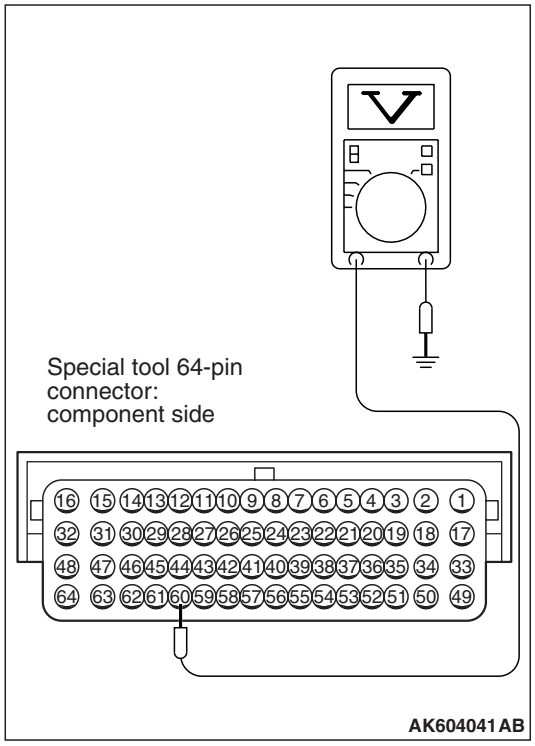
YES : Go to Step 7.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 7. Measure the voltage at ECM connector B-108 by using check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the check harness special tool MB992110 between the separated connectors.
(2) Start the engine and run at idle.

NOTE: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.



(3) Measure the voltage between terminal No. 60 and ground.
   a. Engine: warming up
   b. Radiator fan: stopped
   c. Headlight switch: OFF to ON
   d. Rear defogger switch: OFF to ON
   e. Stoplight switch: OFF to ON
      - Voltage rises.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the harness measured voltage within the specified range?

YES : Go to Step 8.

NO : Replace the generator. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 9.

STEP 9. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 10.

STEP 10. Check the compression pressure.

Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?

YES : Go to Step 11.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system?

YES : Go to Step 12.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 12. Check the purge control system.
Refer to GROUP 17, Emission Control System –Purge Control System Check (Purge Flow Check) P.17-78.

Q: Is the purge control system normal?

YES : Check the following items, and repair or replace the defective items.
1. Vacuum leak.
2. Check if fuel is contaminated.
3. Check if the injectors are clogged.

Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 8: Idle speed is high (improper idle speed)

COMMENT

- In such cases as the above, the cause is probably that the intake air volume during idle is too great.

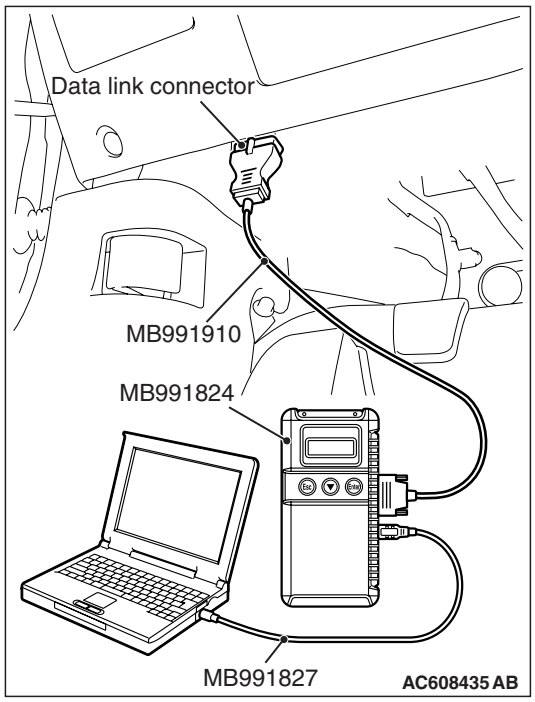
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the engine coolant temperature sensor signal.
- Malfunction of the accelerator pedal position sensor (main) signal.
- Malfunction of the accelerator pedal position sensor (sub) signal.
- Malfunction of the A/C switch signal.
- Malfunction of the power steering pressure switch signal.
- Malfunction of the purge control system.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 06: Engine Coolant Temperature Sensor.
   b. Item 11: Accelerator pedal position sensor (main)
   c. Item 12: Accelerator pedal position sensor (sub)
   d. Item 76: A/C switch
   e. Item 83: Power steering pressure switch
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to GROUP 17, Emission Control System – Evaporative Emission Purge Solenoid Check P.17-79.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 9: Idle speed is low (improper idle speed)

COMMENT

- In cases such as the above, the cause is probably that the intake air volume during idle is too small.

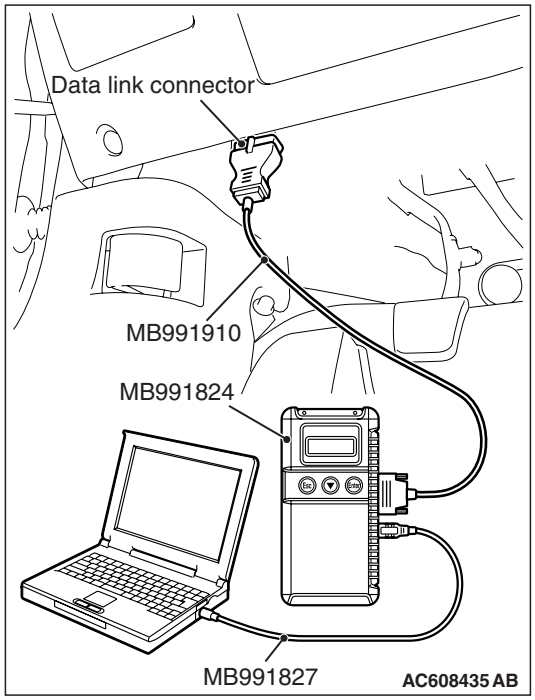
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the engine coolant temperature sensor signal.
- Malfunction of the torque converter <CVT>.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 06: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Refer to GROUP 23A, On-vehicle Service –Torque Converter Stall Test P.23A-25.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

TSB Revision

Inspection procedure 10: When the engine is cold, it stalls at idle (die out)

COMMENT

- In such cases as the above, the air/fuel mixture may be inappropriate when the engine is cold.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system <California>.
- Improper operation of the PCV valve.
- Improper engine oil viscosity
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.

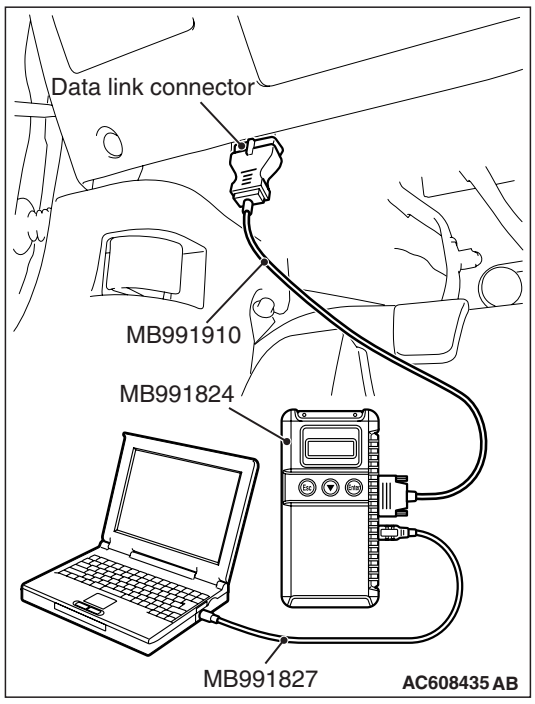
STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.



STEP 3. Using scan tool MB991958, check actuator test.
(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
   a. Item 01: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?
YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 06: Engine Coolant Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?
YES : Go to Step 6.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.
Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?
YES : Go to Step 7.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 9.

STEP 9. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?
YES : Check the engine oil viscosity. Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 11: When the engine is hot, it stalls at idle die out)

COMMENT

- In cases such as the above, the ignition system, air/fuel mixture or compression pressure may be faulty. In addition, if the engine suddenly stalls, the cause may also be a connector damage.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression
- Malfunction of the EGR system <California>.
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

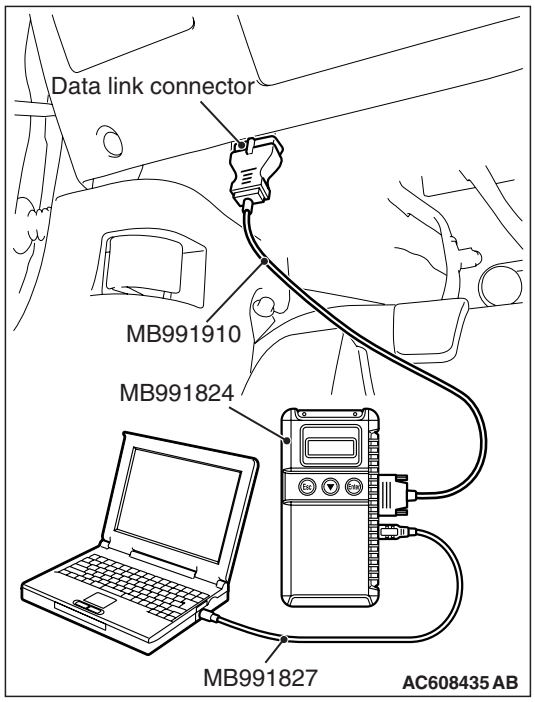
DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?
YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test item 01: injector.

(1) Turn the ignition switch to the "ON" position.
(2) Check following items in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
  a. Item 01: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 05: Intake Air Temperature Sensor.
  b. Item 06: Engine Coolant Temperature Sensor.
  c. Item 13: Throttle position sensor (main).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

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STEP 5. Check the fuel pressure.
Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the ignition timing.
Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?

YES : Go to Step 7.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.
Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 9.

STEP 9. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?

YES : Go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system?

YES : Go to Step 11.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 11. Engine stall reproduction test.

Q: Is it easy to reproduce the engine stall?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
b. Check if fuel is contaminated.
c. Check if the injectors are clogged.
d. Check if the foreign materials (water, kerosene, etc.) got into fuel.
Then confirm that the malfunction symptom is eliminated.

NO : Check if the following signals change suddenly by wiggling the circuit harness and connectors.
a. Crankshaft position sensor signal.
b. Mass airflow sensor signal.
c. Injector drive signal.
d. Primary and secondary ignition signal.
e. Fuel pump drive signal.
f. ECM power supply voltage.
Then confirm that the malfunction symptom is eliminated.

Inspection procedure 12: The engine stalls accelerating (pass out)

COMMENT

- In case such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system
- Improper operation of the PCV valve.
- Vacuum leak.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

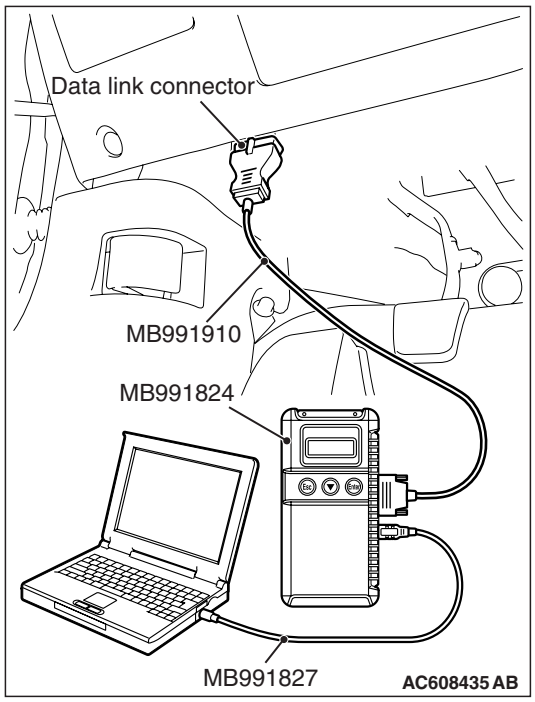
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
  a. Item 08: Evaporative Emission Purge Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 5.

STEP 5. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 6.

STEP 6. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system?
YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 13: The engine stalls decelerating

COMMENT

- Abnormal air/fuel ratio or other similar defects due to insufficient intake air volume and defective EGR system is suspected to be the causes.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the purge control system.
- Malfunction of the EGR system.
- Malfunction of the ECM.

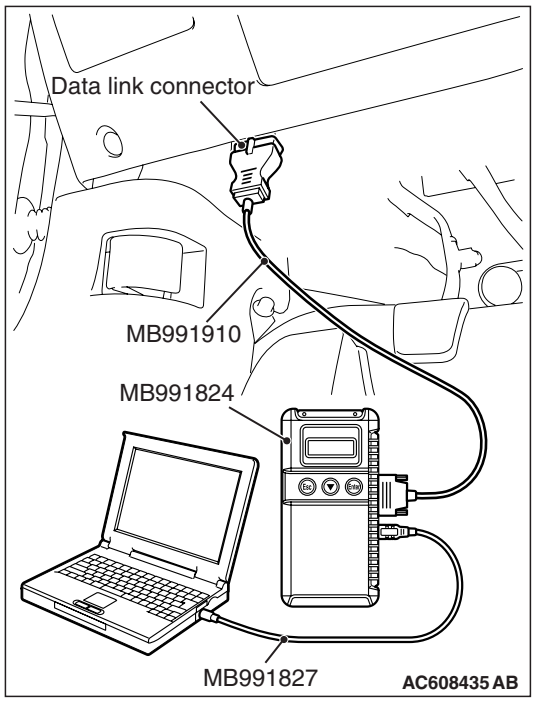
DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

Q: Is the initialization sound heard in the EGR valve?
YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.



STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Engine stall reproduction test.

Q: Does the engine stall during the decrease in engine speed after running?

YES : Go to Step 5.
NO : Go to Step 4.

STEP 4. Using scan tool MB991958, check actuator test.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following item in the actuator test. Refer to Actuator Test Reference Table P.13A-902.
   a. Item 10: Evaporative Emission Purge Solenoid.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the actuator operating properly?

YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 13: Throttle Position Sensor (main).
   b. Item 15: Throttle Position Sensor (sub).
   c. Item 11: Accelerator Pedal Position Sensor (main).
   d. Item 12: Accelerator Pedal Position Sensor (sub).
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Check the ignition coil. Refer to GROUP 16, Ignition System –Then confirm that the malfunction symptom is eliminated.

Inspection procedure 14: Hesitation, sag, stumble, poor acceleration or surge

COMMENT

- Defective ignition system, abnormal air/fuel ratio, poor compression pressure, etc. are suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the fuel pump system.
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system <California>.
- Improper operation of the PCV valve.
- Vacuum leak.
- Clogged air cleaner.
- Clogged exhaust system.
- Increased resistance to the transmission drive
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

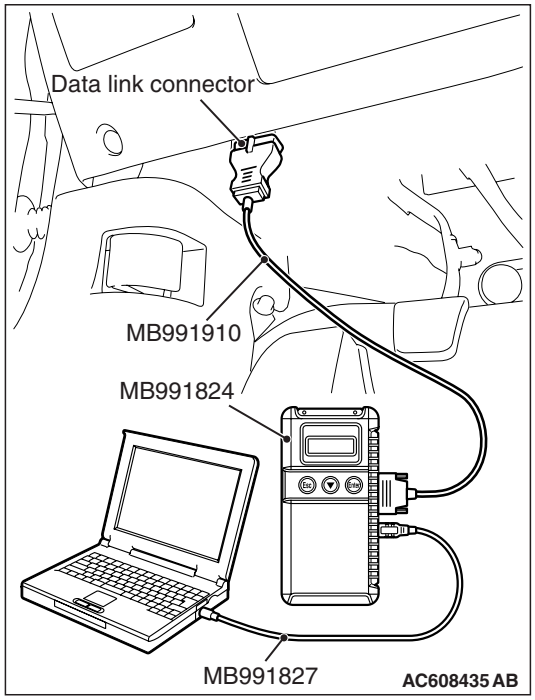
Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Using scan tool MB991958, check actuator test item 01: injector.

(1) Turn the ignition switch to the "ON" position.
(2) Test Reference Table P.13A-902.
  a. Item 01: Injector.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are thy operating properly?

YES : Go to Step 4.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check the ignition timing.

(1) Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?

YES : Go to Step 5.

NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 5. Using scan tool MB991958, check data list and actuator test.

(1) Turn the ignition switch to the "ON" position.

(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.

a. Item 05: Intake Air Temperature Sensor.

b. Item 06: Engine Coolant Temperature Sensor.

c. Item 13: Throttle Position Sensor (main).

d. Item 15: Throttle Position Sensor (sub).

e. Item 11: Accelerator Pedal Position Sensor (main).

f. Item 12: Accelerator Pedal Position Sensor (sub).

(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 6.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the fuel pressure.

Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 7.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 8.

STEP 8. Check the ignition coil.

(1) Remove the intake manifold.

(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 9.

STEP 9. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system?

YES : Check the following items, and repair or replace the defective items.
a. Vacuum leak.
b. Clogged air cleaner.
c. Clogged exhaust system.
d. Check if fuel is contaminated.
e. Check if the injectors are clogged.
f. Check if the foreign materials (water, kerosene, etc.) got into fuel.

Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 15: Acceleration shock

COMMENT

- There may be an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.

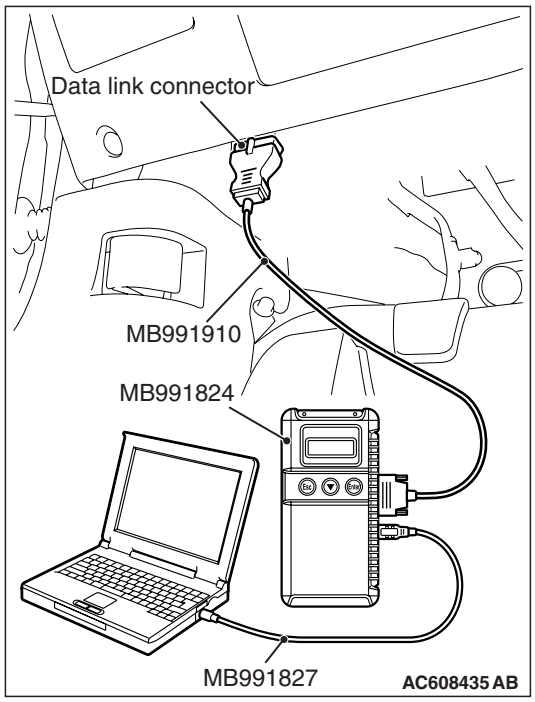
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition system.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Check the spark plugs.

Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 3.

STEP 3. Check the ignition coil.

(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Check for occurrence of ignition leak. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 16: Knocking

COMMENT

- Incases such as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.

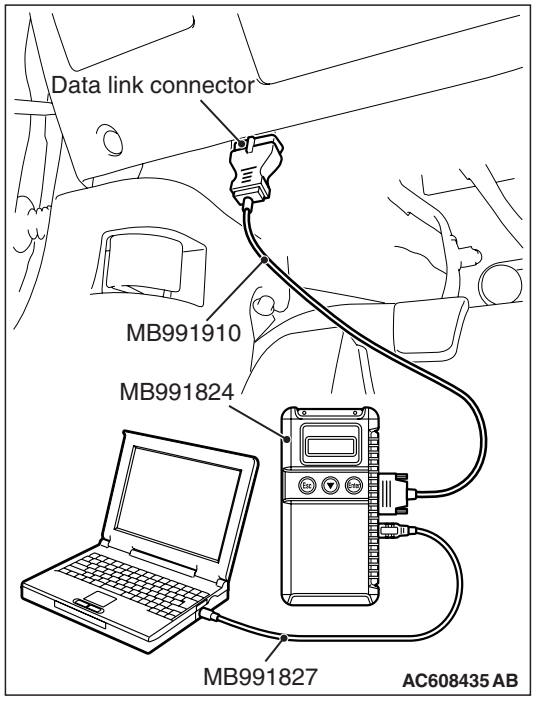
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Defective knock sensor.
- Incorrect heat value of the spark plug.
- Poor compression.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using the scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 2.

STEP 2. Using scan tool MB991958, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 32: Knock retard.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?
YES : Go to Step 3.
NO : Refer to DTC P0326 –Knock Sensor Circuit range/performance problem P.13A-438, DTC P0327 – Knock Sensor Circuit Low Input P.13A-442, DTC P0328 - Knock Sensor Circuit High Input P.13A-446.

STEP 3. Check the spark plugs.
Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?
YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 4.

STEP 4. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?
YES : Check the following items, and repair or replace the defective items.
  a. Check if fuel is contaminated.
  b. Check if the foreign materials (water, kerosene, etc.) got into fuel.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 17: Too high CO and HC concentration when idling

COMMENT
- Abnormal air/fuel ratio is suspected.

TROUBLESHOOTING HINTS (The most likely causes for this case:)
- Malfunction of the fuel pump system. <California>
- Malfunction of the ignition system.
- Poor compression.
- Malfunction of the EGR system <California>.
- Improper operation of the PCV valve.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:
- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.

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- MB991827: USB Cable
- MB991910: Main Harness A

STEP 1. Check if the EGR valve sounds during initialization.

NOTE: Excluding the vehicle with the specification for California, go to Step 2.

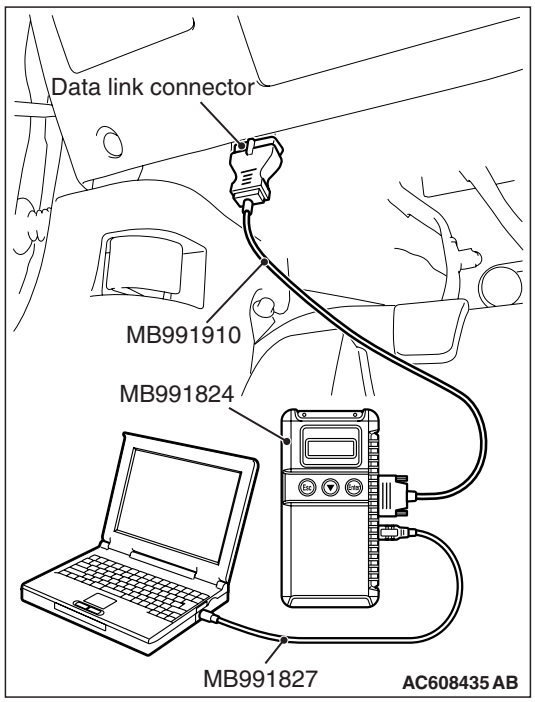
Q: Is the initialization sound heard in the EGR valve?

YES : Go to Step 2.
NO : Refer to GROUP 17, Emission Control –EGR Valve (Stepper Motor) Check P.17-82.

STEP 2. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.



Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Go to Step 3.

STEP 3. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?

YES : Go to Step 4.
NO : Check for installed conditions of the timing chain. Then confirm that the malfunction symptom is eliminated.

STEP 4. Using scan tool MB991958, check data list.
(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 06: Engine Coolant Temperature Sensor.
  b. Item 05: Intake Air Temperature Sensor.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?
YES : Go to Step 5.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 5. Check the fuel pressure.
Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?
YES : Go to Step 6.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check the spark plugs.
Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?
YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 7.

STEP 7. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?
YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 8.

STEP 8. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?
YES : Go to Step 9.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system?

YES : Go to Step 10.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the purge control system.
Refer to GROUP 17, Emission Control System –Purge Control System Check (Purge Flow Check) P.17-78.

Q: Is the purge control system normal?

YES : Check the following items, and repair or replace the defective items.
a. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 18: Transient, mass emission tailpipe test failure

COMMENT

- The test is failed when the air/fuel ratio is not controlled to the ideal air/fuel ratio. This occurs due to the feedback control by heated oxygen sensor signals, insufficient EGR flow rate, or deteriorated catalyst.

NOTE: If the three-way catalyst temperature is low when checking the exhaust gas, the three-way catalyst cannot sufficiently clean the emissions. Warm up the engine sufficiently before checking the exhaust, and check immediately.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of air/fuel ratio control system.
- Malfunction of the EGR system <California>.
- Deteriorated catalyst.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check the exhaust gas with the engine at normal operating temperature.

Q: Was the exhaust gas checked with engine warmed sufficiently?

YES : Go to Step 2.
NO : Check it again after enough warm up.

STEP 2. Check the following items.

(1) Check the following items.

a. Check all vacuum hoses and connectors.

b. Check electrical wires and connectors for obvious problems.

Q: Are they normal?

YES : Go to Step 3.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the driveability.

Q: Is the driveability normal?

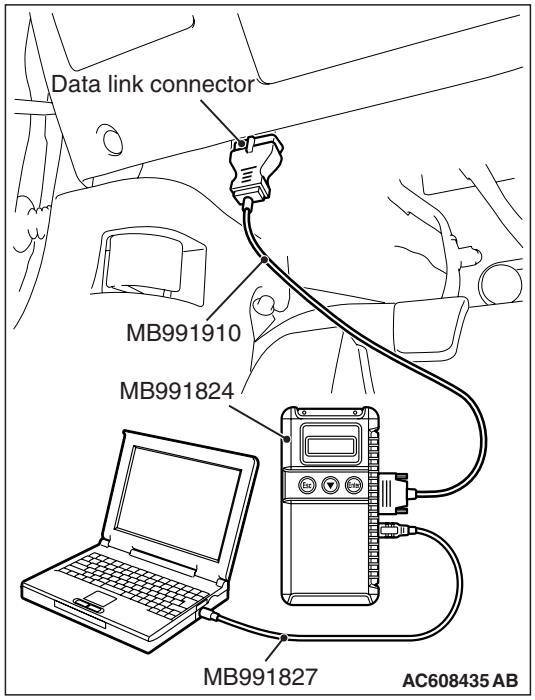
YES : Go to Step 4.

NO : Refer to Trouble Symptom Chart P.13A-51.

STEP 4. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.



(1) Connect scan tool MB991958 to the data link connector.

(2) Turn the ignition switch to the "ON" position.

(3) Read the DTC.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.

NO : Go to Step 5.

STEP 5. Check the ignition timing.

Refer to GROUP 11A, On-vehicle Service –Ignition Timing Check P.11A-11.

Q: Is the ignition timing normal?

YES : Go to Step 6.

NO : Check that the crankshaft position sensor and timing chain case are in the correct position. Then confirm that the malfunction symptom is eliminated.

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STEP 6. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items in the data list. Refer to Data List Reference Table P.13A-879.
   a. Item 06: Engine Coolant Temperature Sensor.
   b. Item 05: Intake Air Temperature Sensor.
   c. Item AC: Heated Oxygen Sensor (front)
   d. Item BB: Barometric Pressure Sensor
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 7.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 7. Using scan tool MB991958, check data list item AD: Heated oxygen sensor (rear).

(1) Start the engine and run at idle.
(2) Set scan tool MB991958 to the data reading mode for item AD, Heated Oxygen Sensor (rear).
   a. Transaxle: 2nd (5 positions CVT: "L" range)
   b. Drive with wide open throttle
   c. Engine: 3,500 r/min
      - The output voltages should be between 0.6 and 1.0 volt.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 9 <Except for California>, Go to Step 8 <California>
NO : Refer to, P0137 –Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-274, DTC P0138 –Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-292, DTC P0139 –Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-300, DTC P0140 –Heated Oxygen Sensor Circuit No Activity Detected (sensor 2) P.13A-308. <Except for California>, P0137 –Heated Oxygen Sensor Circuit Low Voltage (sensor 2) P.13A-283, DTC P0138 –Heated Oxygen Sensor Circuit High Voltage (sensor 2) P.13A-296, DTC P0139 –Heated Oxygen Sensor Circuit Slow Response (sensor 2) P.13A-304, DTC P0140 –Heated Oxygen Sensor Circuit No Activity Detected (sensor 2) P.13A-312 <California>.

STEP 8. Check the EGR system <California>.

Refer to GROUP 17, Emission Control System –General Description (EGR System) P.17-81.

Q: Is the EGR system normal?

YES : Go to Step 9.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 9. Check the fuel pressure.
Refer to Fuel Pressure Test P.13A-929.

Q: Is the fuel pressure normal?

YES : Go to Step 10.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 10. Check the spark plugs.
Refer to GROUP 16, Ignition System –On-vehicle service – Spark Plug Check P.16-37.

Q: Are there any abnormalities?

YES : Replace the spark plug. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 11.

STEP 11. Check the ignition coil.
(1) Remove the intake manifold.
(2) Refer to GROUP 16, Ignition System –On-vehicle service – Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 12.

STEP 12. Check the compression pressure.
Refer to GROUP 11A, On-vehicle service –Compression Pressure Check P.11A-16.

Q: Is the compression pressure normal?

YES : Go to Step 13.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 13. Check the positive crankcase ventilation system.
Refer to GROUP 17, Emission Control System –Positive Crankcase Ventilation System Check P.17-75.

Q: Is the positive crankcase ventilation system,?

YES : Go to Step 14.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 14. Check the purge control system.
Refer to GROUP 17, Emission Control System –Purge Control System Check (Purge Flow Check) P.17-78.

Q: Is the purge control system normal?

YES : Check the following items, and repair or replace the defective items.
a. Check if the injectors are clogged.
Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 15. Check the following items.
(1) Check the following items.
a. Check the injectors for fuel leakage.

Q: Are there any abnormalities?

YES : Replace it. Then confirm that the malfunction symptom is eliminated.
Then confirm that the malfunction symptom is eliminated.

NO : Replace the catalytic converter. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 19: Purge flow test of the evaporative emission canister failure

COMMENT

- The test fails when the purge line or purge port is clogged or if the evaporative emission purge solenoid fails.

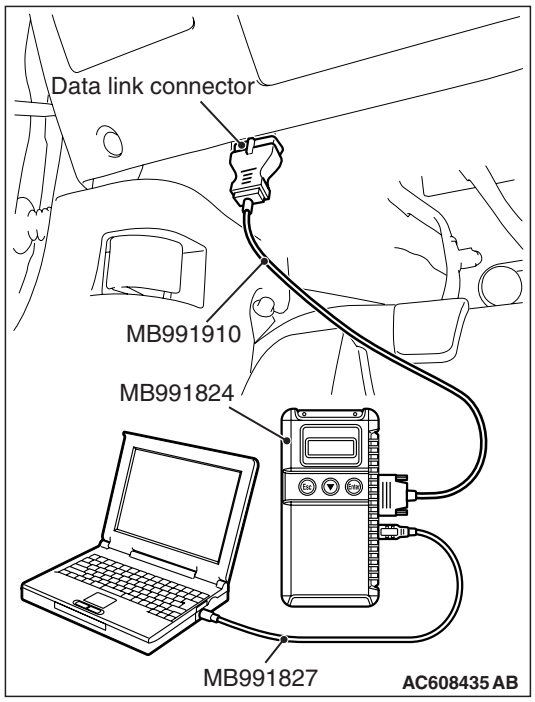
TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Purge line or purge port is clogged.
- Malfunction of the evaporative emission purge solenoid.
- Evaporative emission canister is clogged.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A



STEP 1. Using scan tool MB991958, read the diagnostic trouble code (DTC).

⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Read the DTC.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is any DTC set?

YES : Refer to Diagnostic Trouble Code Chart P.13A-46.
NO : Refer to GROUP 17, Emission Control System – Purge Control System Check (Purge Flow Check) P.17-78.

Inspection procedure 20: Pressure test of the evaporative system failure

COMMENT

- The test fails if there is a leak from the fuel tank or vapor line.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Loose fuel tank filler tube cap.
- Broken seal in fuel tank, vapor line evaporative emission canister.

DIAGNOSIS

STEP 1. Check the evaporative emission purge solenoid.
Refer to GROUP 17, Emission Control System –Evaporative Emission Purge Solenoid Check P.17-79.

Q: Is the evaporative emission purge solenoid normal?

YES : Go to Step 2.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the evaporative emission ventilation solenoid.

Refer to GROUP 17, Emission Control System –Evaporative Emission Ventilation Solenoid Check P.17-88.

Q: Is the evaporative emission ventilation solenoid normal?

YES : Check the following items, and repair or replace the defective items.

a. Check for leaks from the vapor line or evaporative emission canister.

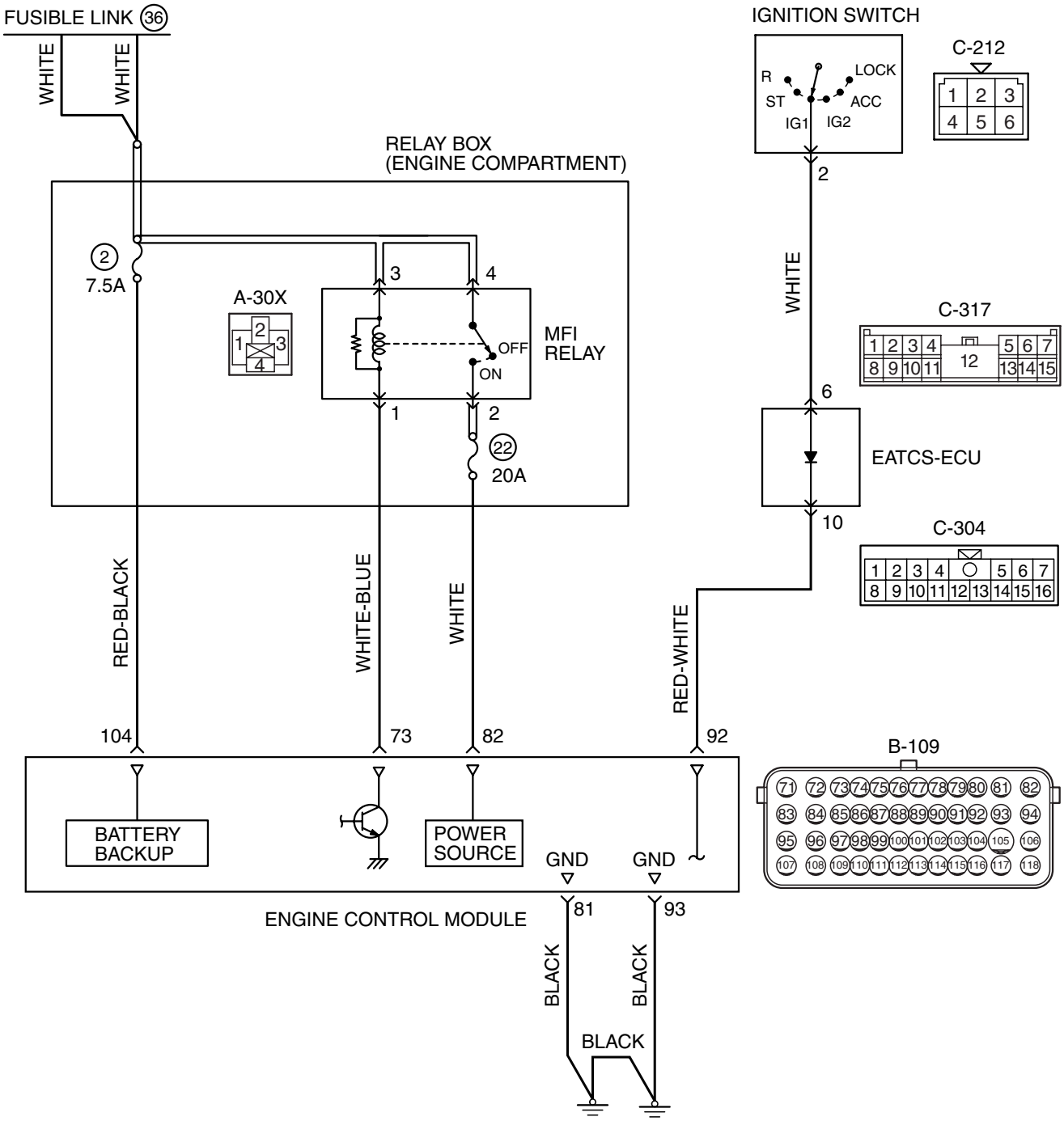
b. Check for leaks from the fuel tank.

Then confirm that the malfunction symptom is eliminated.

NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 21: Power supply system and ignition switch-IG system

POWER SUPPLY AND IGNITION SWITCH-IG CIRCUIT



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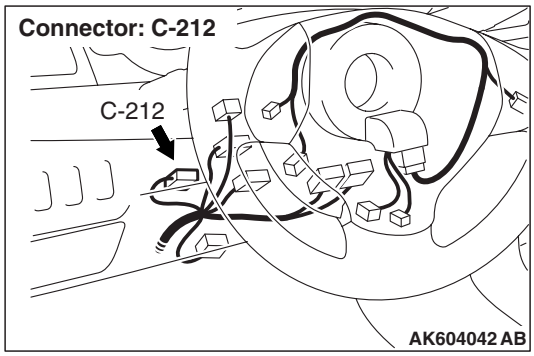

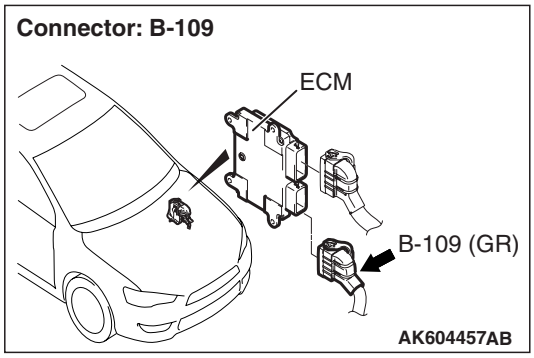

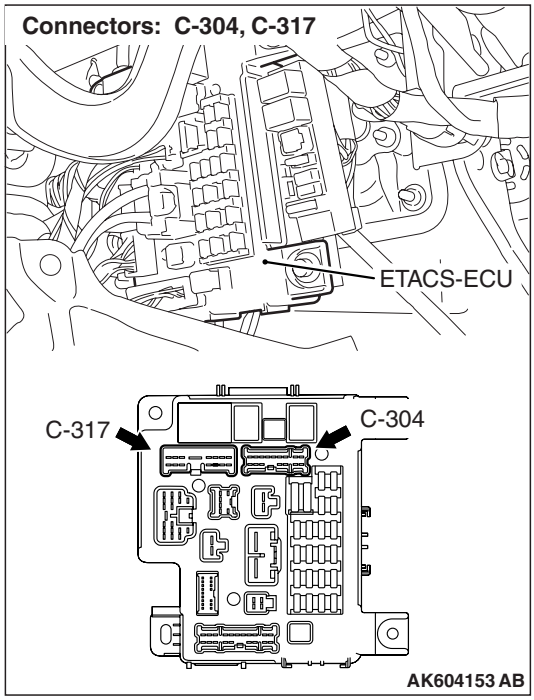

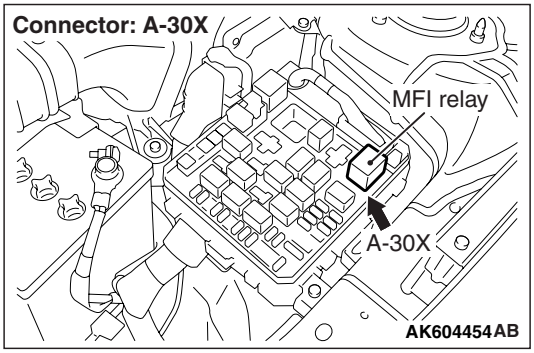

CIRCUIT OPERATION

- Battery positive voltage is applied to the MFI relay (terminals No. 3, No. 4).
- When the ignition switch is turned to the "ON" position, battery positive voltage is applied to the ECM (terminal No. 92). When battery positive voltage is applied, the ECM turns the power transistor in the ECM "ON" and grounds the MFI relay coil. With this, the MFI relay turns "ON" the battery positive voltage is supplied to the ECM (terminals No. 82) from the MFI relay (terminal No. 2).
- A battery positive voltage is constantly supplied to the ECM (terminal No. 104) as the backup power.
- The ECM (terminals No. 81, No. 93) is grounded to the vehicle body.

COMMENT

- When the ignition switch "ON" signal is input into the ECM via ETACS-ECU, the ECM turns "ON" the MFI relay. This causes battery positive voltage to be supplied to the ECM, sensor and actuator.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the ignition switch.
- Malfunction of the MFI relay.
- Improper connector contact, open circuit or short-circuit harness wire.
- Malfunction of the ECM.

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DIAGNOSIS

STEP 1. Check harness connector A-30X at MFI relay and harness connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

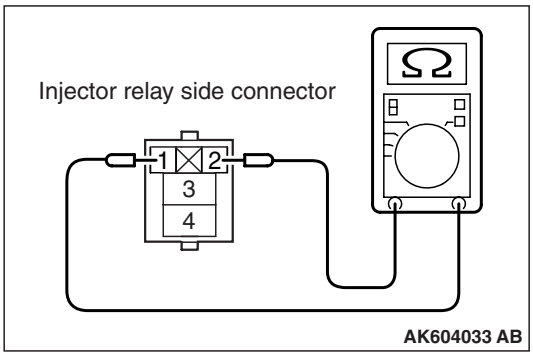
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

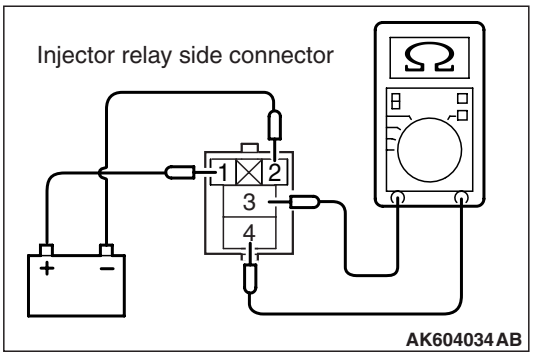
STEP 2. Check the MFI relay.

(1) Remove the MFI relay.

(2) Check for continuity between the MFI relay terminals No. 1 and No. 3.

- There should be continuity. (approximately 2 ohms)





(3) Use jumper wires to connect MFI relay terminal No. 3 to the positive battery terminal and terminal No. 1 to the negative battery terminal.

(4) Check for continuity between the MFI relay terminals No. 2 and No. 4 while connecting and disconnecting the jumper wire at the negative battery terminal.

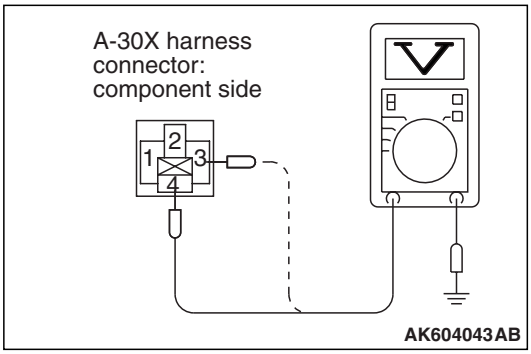
- Should be less than 2 ohms. (Negative battery terminal connected)
- Should be open loop. (Negative battery terminal disconnected)

(5) Install the MFI relay.

Q: Is the measured resistance within the specified range?

YES : Go to Step 3.

NO : Replace the MFI relay. Then confirm that the malfunction symptom is eliminated.



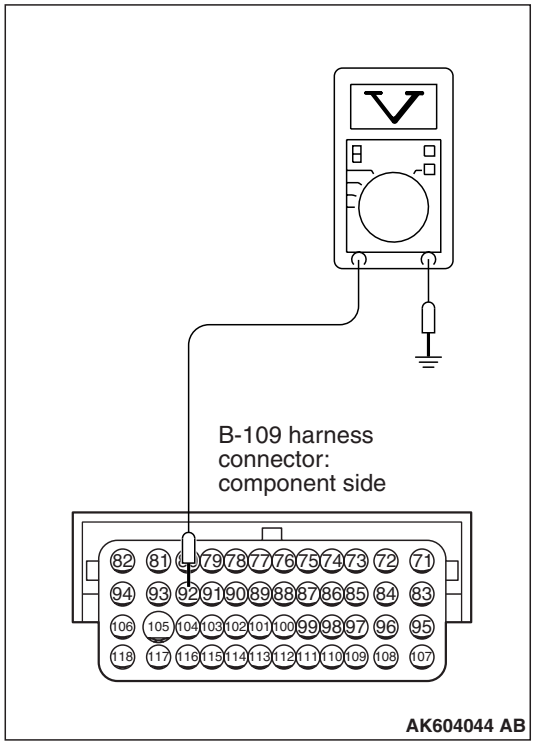
STEP 3. Measure the power supply voltage at MFI relay harness side connector A-30X.

(1) Disconnect the connector A-30X and measure at the harness side.
(2) Measure the voltage between terminals No. 3, No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

NO : Repair harness wire between fusible link (36) and MFI relay connector A-30X (terminal No. 3, No. 4) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 4. Measure the ignition switch-IG signal voltage at ECM harness side connector B-109.

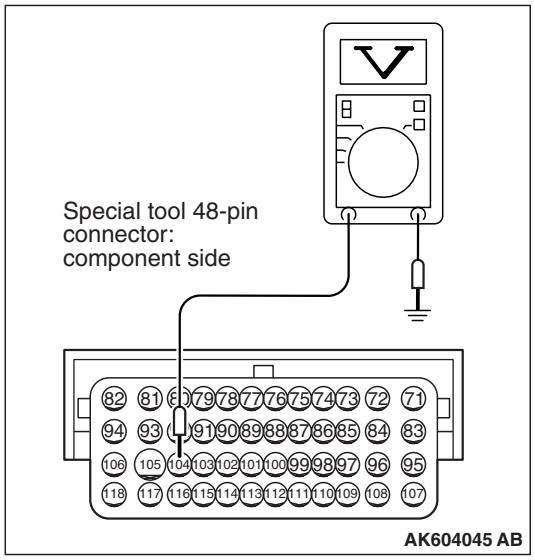
(1) Disconnect the connector B-109 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 92 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.

NO : Check harness connectors C-304 and C-317 at intermediate connector for damage, and repair or replace as required. Refer to, GROUP 00E, Harness Connector Inspection P.00E-2. If intermediate connectors are in good condition, repair harness wire between ignition switch connector C-212 (terminal No. 2) and ECM connector B-109 (terminal No. 92) because of open circuit. Then confirm that the malfunction symptom is eliminated.



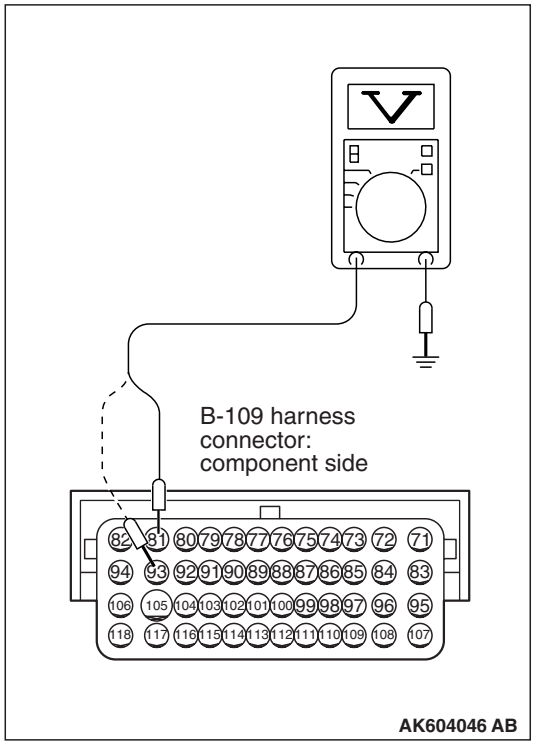
STEP 5. Measure the backup power supply voltage at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Measure the voltage between terminal No. 104 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 6.

NO : Repair harness wire between relay box (fuse 2) and ECM connector B-109 (terminal No. 104) because of short circuit. Then confirm that the malfunction symptom is eliminated.



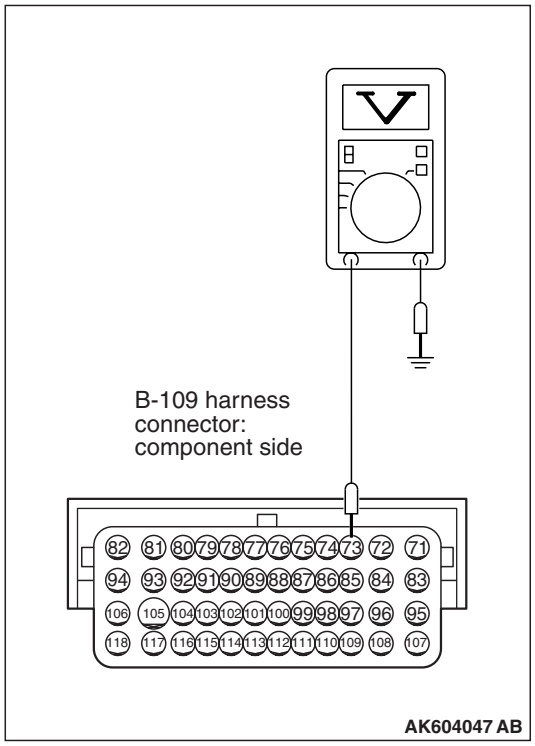
STEP 6. Check for continuity at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Check for the continuity between terminals (No. 81, No. 93) and ground.
- Should be less than 2 ohms.

Q: Does continuity exist?

YES : Go to Step 7.

NO : Repair harness wire between ECM connector B-109 (terminal No. 81, No. 93) and ground because of open circuit and harness damage. Then confirm that the malfunction symptom is eliminated.



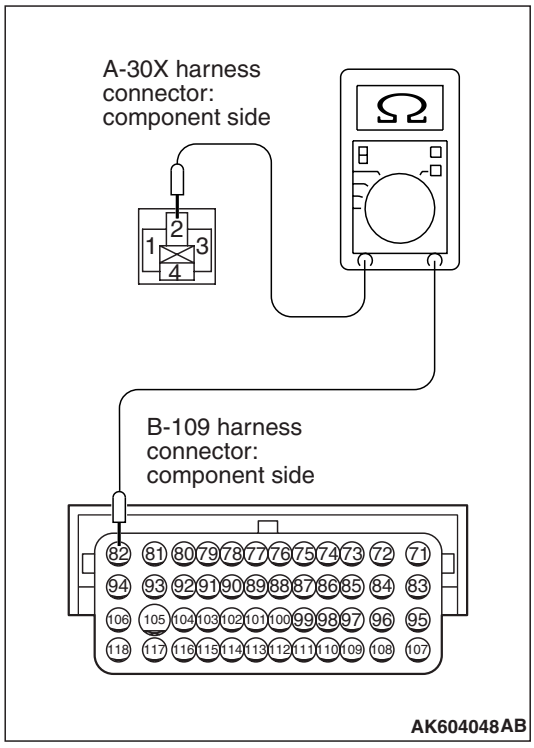
STEP 7. Measure the power supply voltage at ECM harness side connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Measure the voltage between terminal No. 73 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 8.

NO : Repair harness wire between MFI relay connector and ECM A-30X (terminal No. 1) connector B-109 (terminal No. 73) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 8. Check for open circuit and harness damage between MFI relay connector A-30X (terminal No. 2) and ECM connector B-109 (terminal No. 82).

(1) Disconnect the connector A-30X and B-109 measure at the harness side.
(2) Measure the resistance between connector A-30X (terminal No. 2) and connector B-109 (terminal No. 82).
- Should be less than 2 ohms.

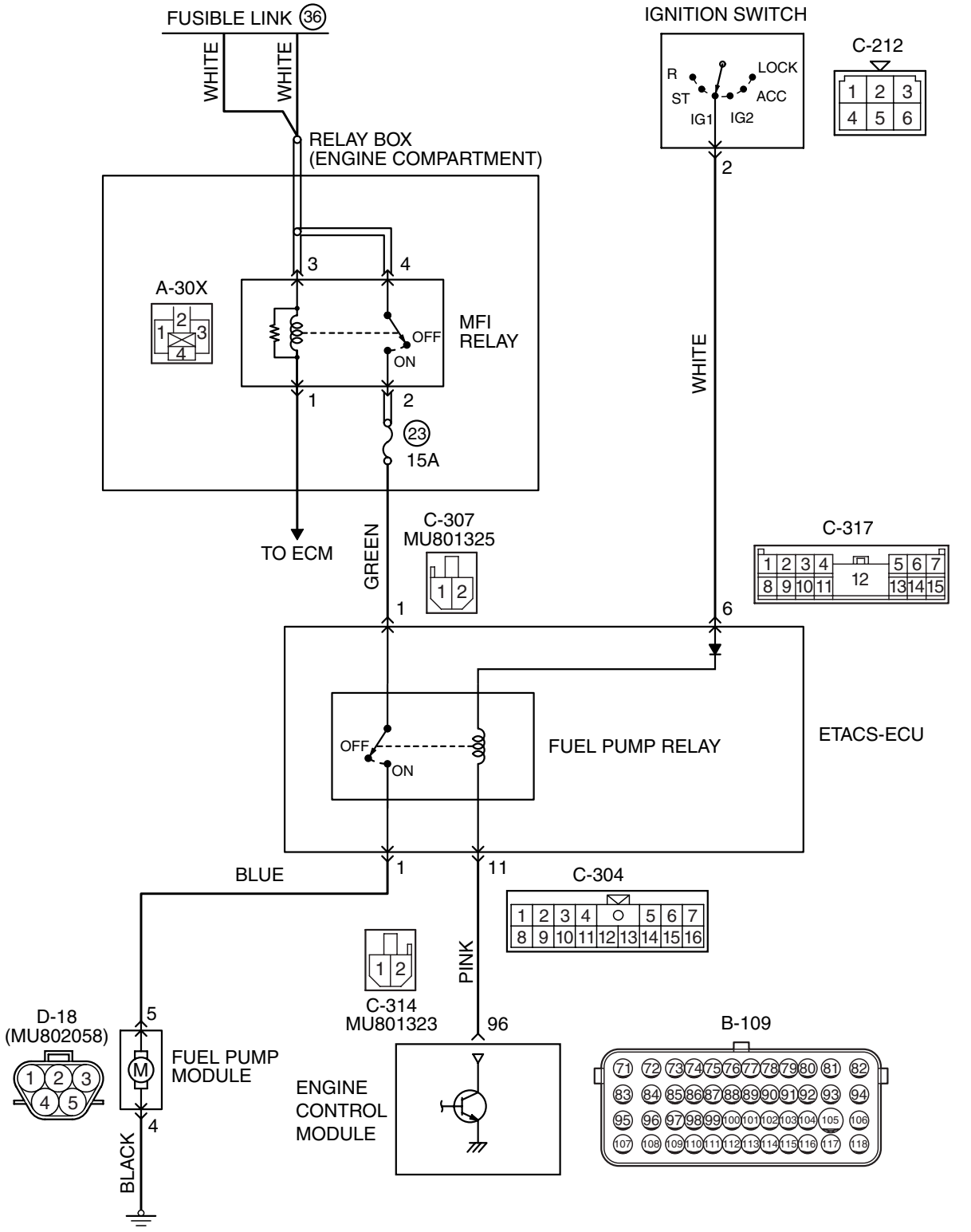
Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 22: Fuel pump system

FUEL PUMP CIRCUIT



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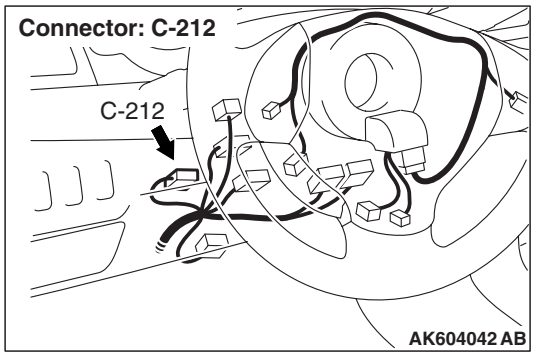

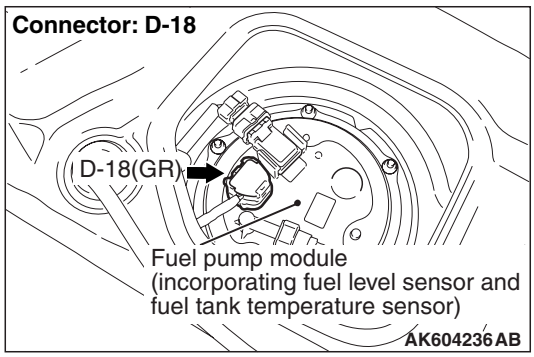

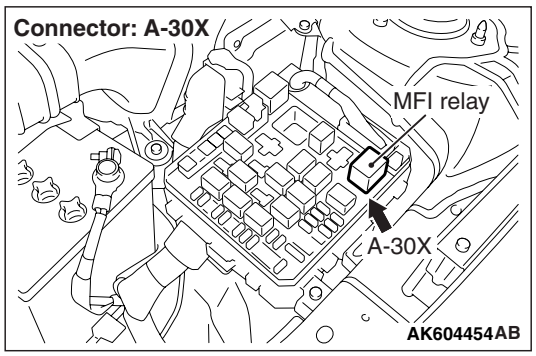

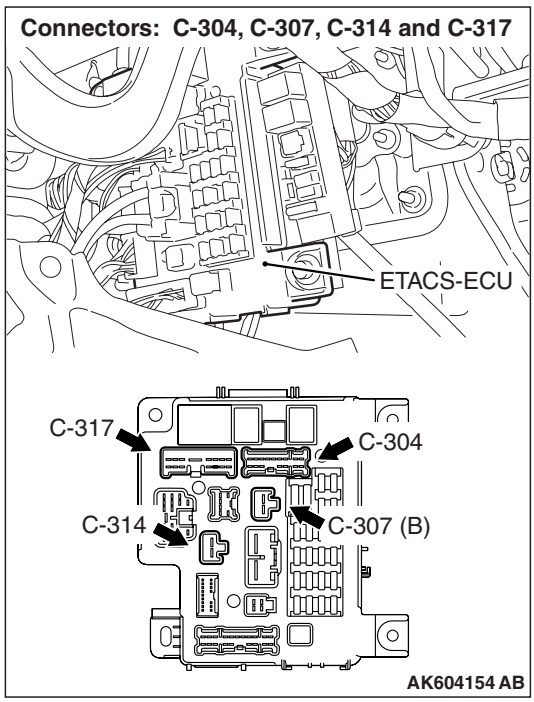

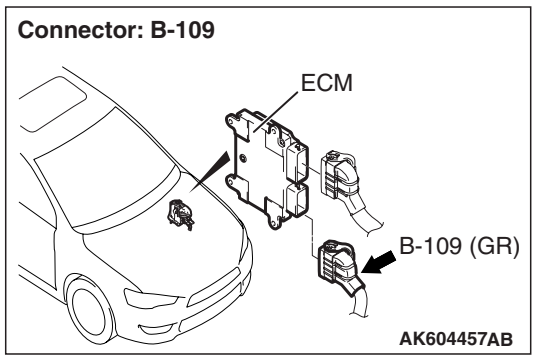

CIRCUIT OPERATION

- The fuel pump drive power is supplied from MFI relay (terminal No. 2) to fuel pump relay (C-307 ETACS-ECU connector terminal No. 1) in the ETACS-ECU.
- The battery positive voltage is applied by the ignition switch to the fuel pump coil (C-317 ETACS-ECU connector terminal No. 6) in the ETACS-ECU. The ECM turns "ON" the relay by turning "ON" the power transistor in the unit so as to conduct power to the fuel pump relay coil (via the C-304 ETACS-ECU connector terminal No. 11).
- When the fuel pump relay is turned "ON", the battery positive voltage will be supplied from the fuel pump relay (C-314 ETACS-ECU connector terminal No. 1) to the fuel pump.

COMMENT

- When the ignition switch ON signal is inputted into the ECM, the ECM turns ON the fuel pump relay. This causes the battery voltage to be supplied to the fuel pump.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Malfunction of the fuel pump relay.
- Malfunction of the fuel pump.
- Improper connector contact, open or short-circulated harness wire.
- Malfunction of the ECM.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)

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- MB991824: V.C.I.
- MB991827: USB Cable
- MB991910: Main Harness A

STEP 1. Check harness connector C-304, C-307, C314 and C-317 at MFI relay for damage.

Q: Is the connector in good condition?

YES : Go to Step 2.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the fuel pump relay.

Refer to Fuel Pump Relay Continuity Check P.13A-935.

Q: Is the measured resistance normal?

YES : Go to Step 3.

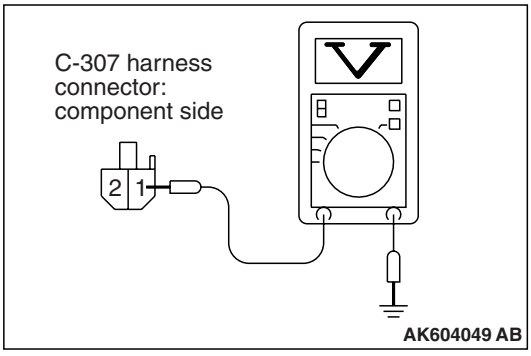
NO : Replace the fuel pump relay. Then confirm that the malfunction symptom is eliminated.

STEP 3. Measure the power supply voltage at ETACS-ECU harness side connector C-307.

(1) Disconnect the connector C-307 and measure at the harness side.

(2) Measure the voltage between terminal No. 1 and ground.

- Voltage should measure battery positive voltage.



Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 4.

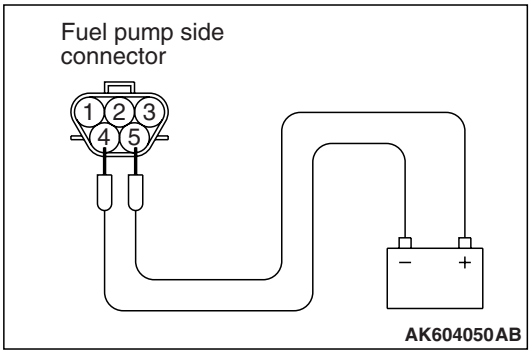
NO : Repair harness wire between relay box (fuse 23) and ETACS-ECU connector C-307 (terminal No. 1) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 4. Check connector D-18 at fuel pump for damage.

Q: Is the connector in good condition?

YES : Go to Step 5.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

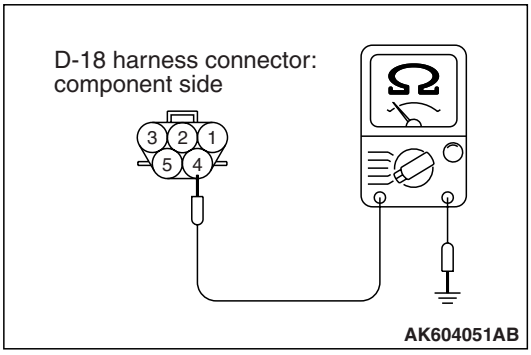


STEP 5. Check the fuel pump operation.

(1) Disconnect fuel pump connector D-18.
(2) Use jumper wires to connect fuel pump connector terminal No. 5 to the positive battery terminal and terminal No. 4 to the negative battery terminal.
- An operating sound of the fuel pump should be heard.

Q: Is the fuel pump operating properly?

YES : Go to Step 6.
NO : Replace the fuel pump. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for continuity at fuel pump harness side connector D-18.

(1) Disconnect the connector D-18 and measure at the harness side.
(2) Check for the continuity between terminal No. 4 and ground.
- Should be less than 2 ohms.

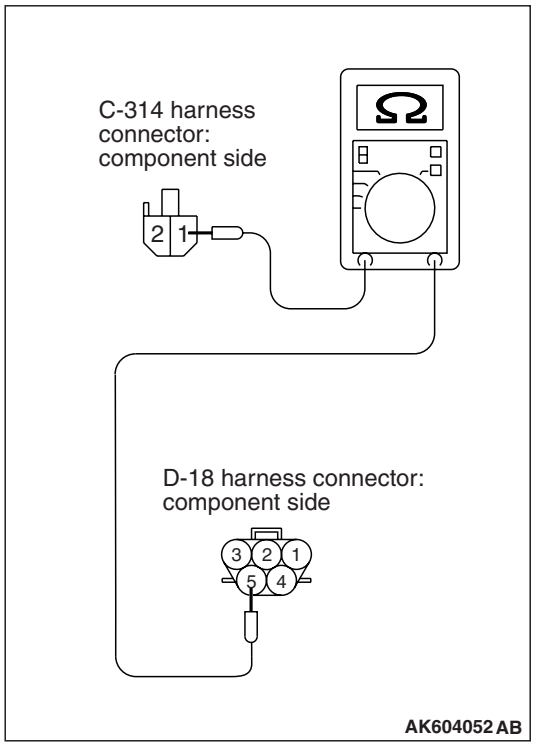
Q: Does continuity exist?

YES : Go to Step 7.
NO : Repair harness wire between fuel pump connector D-18 (terminal No. 4) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.

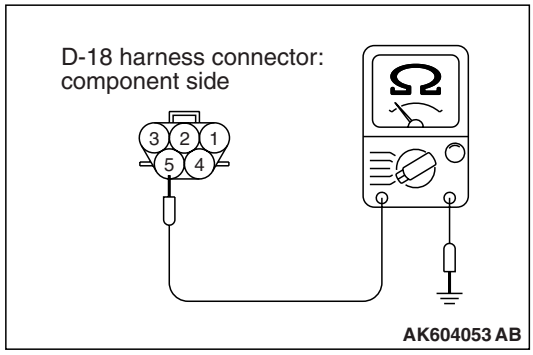
STEP 7. Check for open circuit and short circuit to ground and harness damage between ETACS-ECU connector C-314 (terminal No. 1) and fuel pump connector D-18 (terminal No. 5).

(1) Disconnect the connector C-314 and D-18 measure at the harness side.

(2) Measure the resistance between connector C-314 (terminal No. 1) and connector D-18 (terminal No. 5).
- Should be less than 2 ohms.



(3) Check for the continuity between connector D-18 (terminal No. 5) and ground.
- Not continuity.



Q: Is the harness wire in good condition?

YES : Go to Step 8.

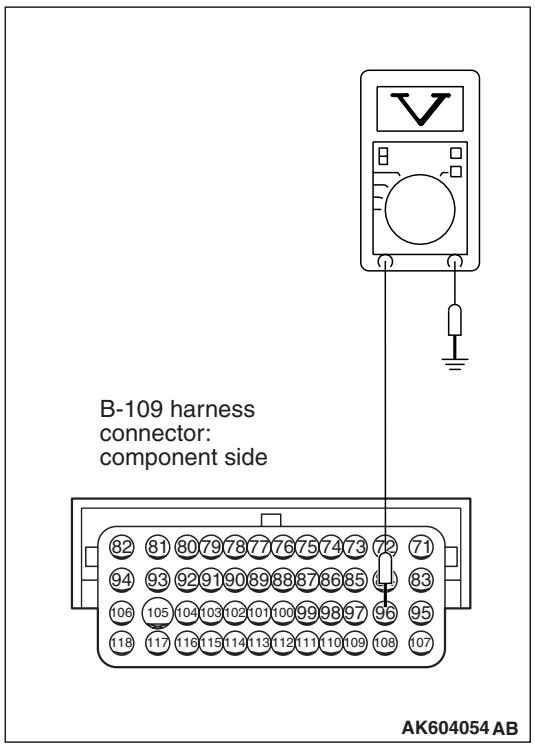
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 8. Check connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 9.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.



STEP 9. Measure the power supply voltage at ECM connector B-109.

(1) Disconnect the connector B-109 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 96 and ground.
- Voltage should be battery positive voltage.

(4) Turn the ignition switch to the "LOCK" (OFF) position.

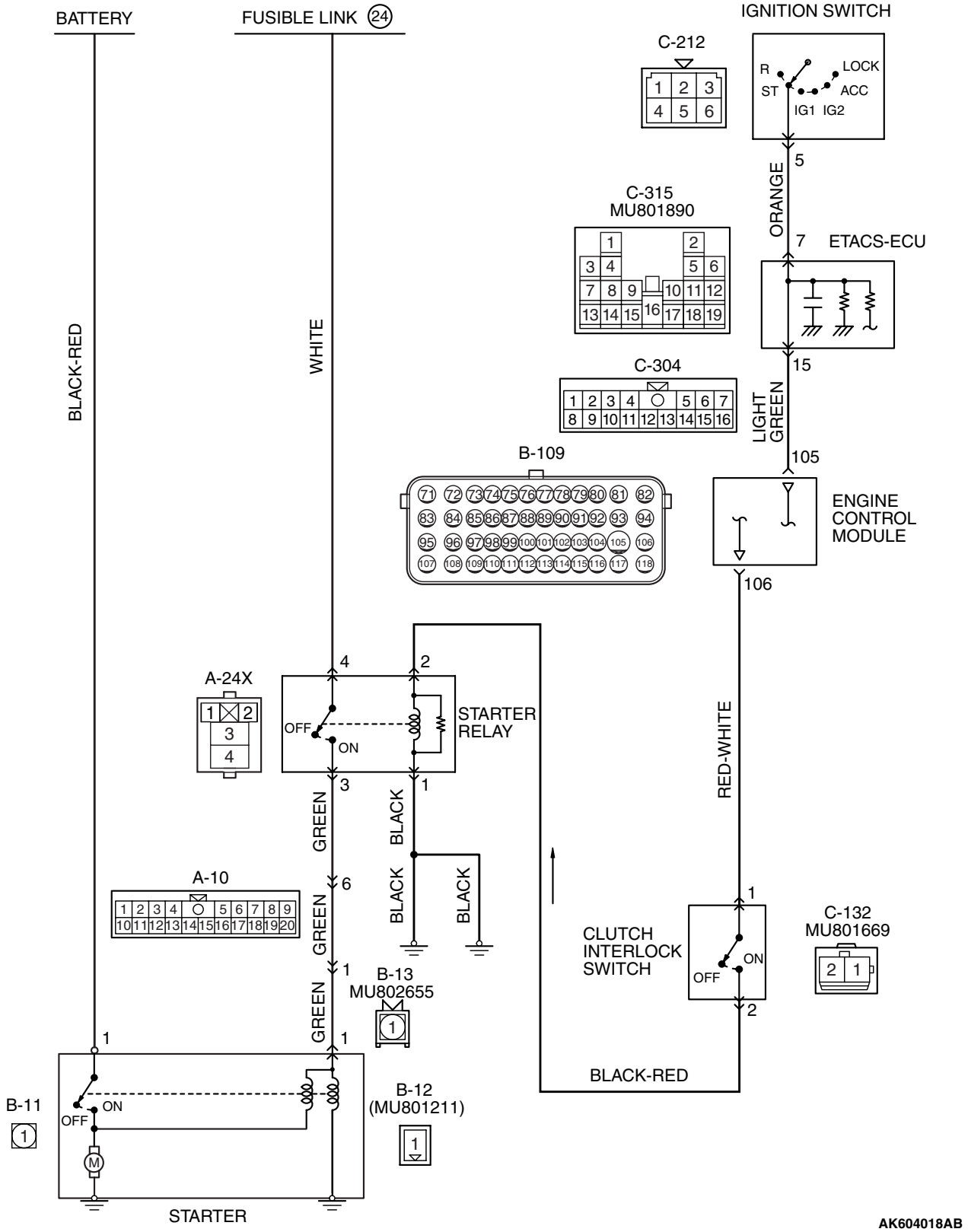
Q: Is battery positive voltage (approximately 12 volts) present?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

NO : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 11) and ECM connector B-109 (terminal No. 96) because of open circuit. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 23: Ignition switch-ST system and starter relay system <M/T>

STARTING SYSTEM CIRCUIT <M/T>



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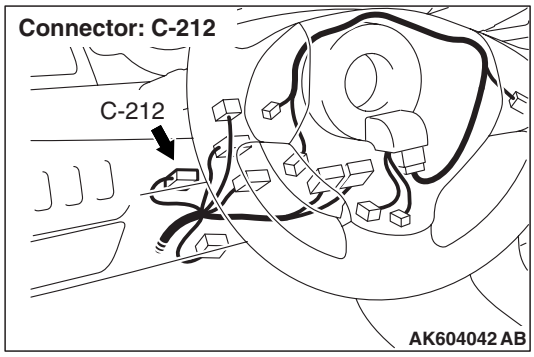
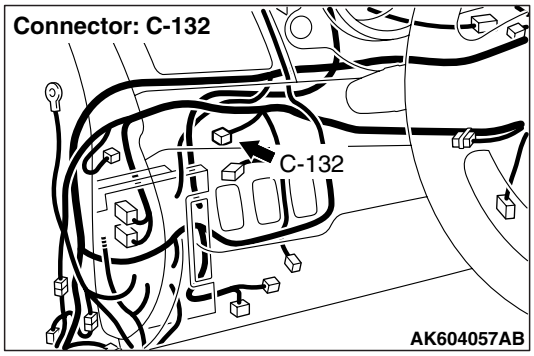
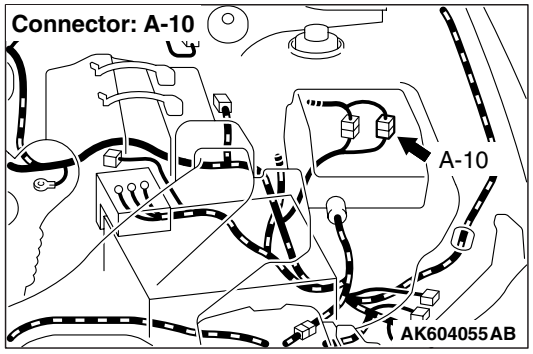
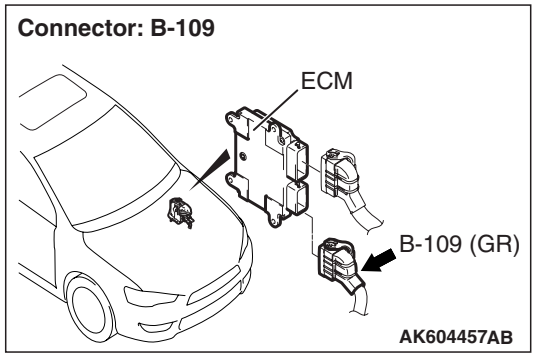
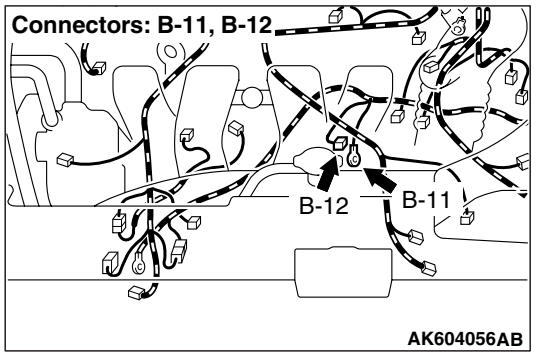
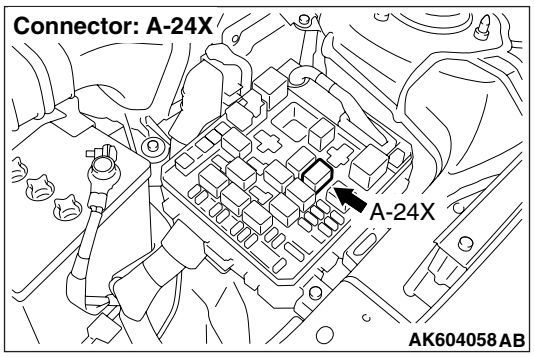


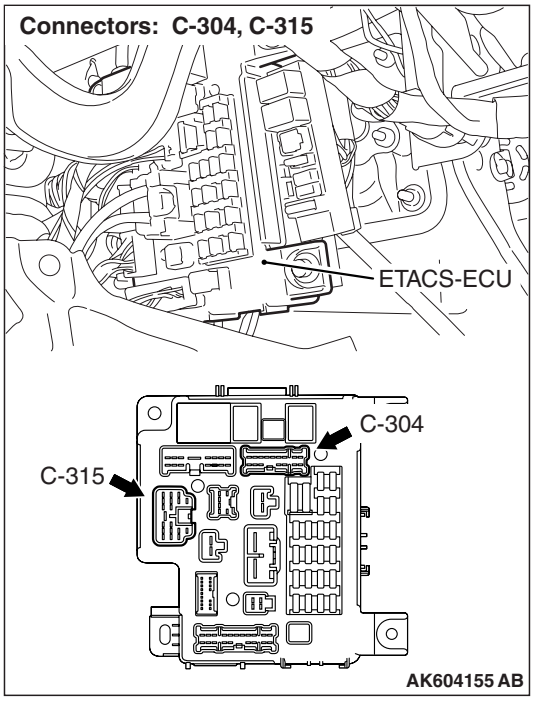












TSB Revision

CIRCUIT OPERATION

- If the clutch interlock switch is ON (when the clutch pedal is depressed.) and the ignition switch is turned to "START" position, battery positive voltage is supplied to starter relay coil. With this, the starter relay turns "ON" the battery positive voltage is supplied to the starter motor (terminal No. 1) from the battery.

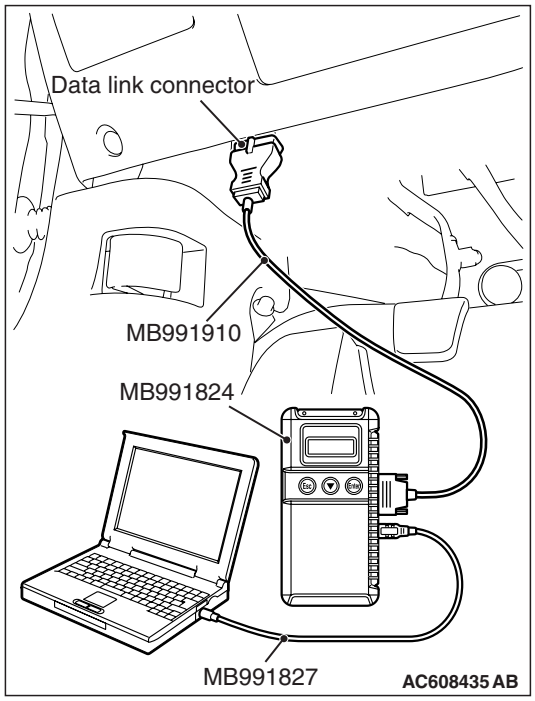
COMMENT

- Faulty starting system and the related circuit are suspected to be the causes.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Battery failed
- Malfunction of the starter motor relay.
- Malfunction of the starter motor.
- Open circuit or short circuit in the starting system or the related circuit or poor contact in the connectors
- Malfunction of the clutch interlock switch.
- Malfunction of the ECM

DIAGNOSIS



STEP 1. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 79: Cranking signal.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 15) and ECM connector B-109 (terminal No. 105) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-132 at clutch interlock switch and harness connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the clutch interlock switch.

Refer to GROUP 21A, Clutch Pedal Check and Master Cylinder –Inspection P.21A-5.

Q: Are there any abnormalities?

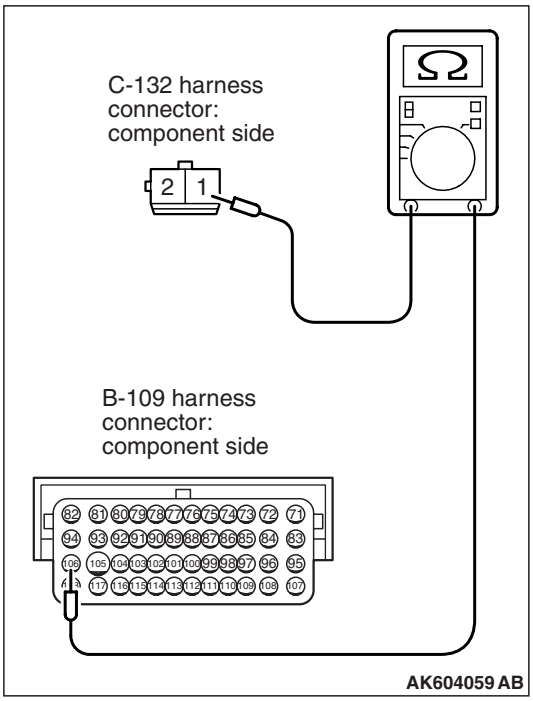
YES : Repair or replace it. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 4.

TSB Revision

STEP 4. Check for open circuit or short circuit to ground or harness damage between clutch interlock switch connector B-132 and ECM connector B-109.

(1) Disconnect the connector B-132 and B-109 measure at the harness side.

(2) Measure the resistance between connector B-132 (terminal No. 1) and connector B-109 (terminal No. 106).
- Should be less than 2 ohms.

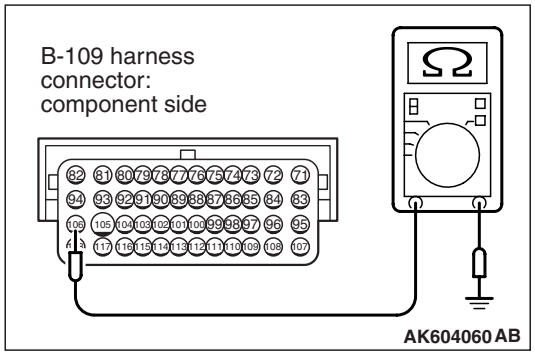


(3) Check for the continuity between connector B-109 (terminal No. 106) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 5. Check harness connector A-24X at starter relay.

Q: Is the connector in good condition?

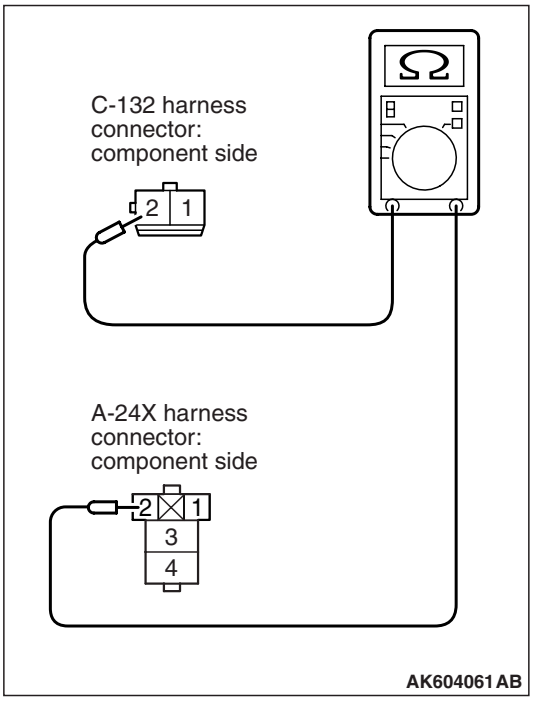
YES : Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for open circuit or short circuit to ground or harness damage between clutch interlock switch connector C-132 and starter relay connector A-24X.

(1) Disconnect the connector C-132 and A-24X measure at the harness side.

(2) Measure the resistance between connector C-132 (terminal No. 2) and connector A-24X (terminal No. 2).
- Should be less than 2 ohms.

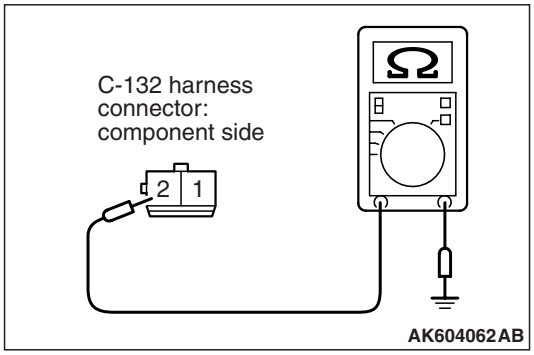


(3) Check for the continuity between connector C-132 (terminal No. 2) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Then go to Step 7.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 7. Check for open circuit or harness damage between starter relay connector A-24X and ground.

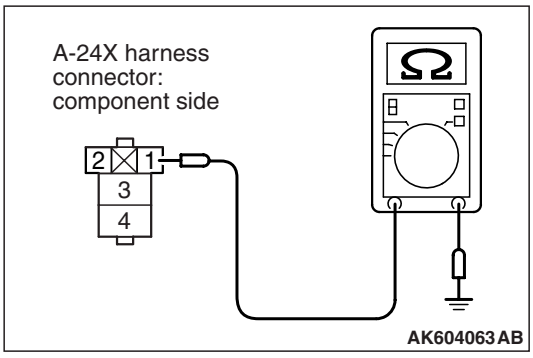
(1) Disconnect the connector A-24X and ground at the harness side.

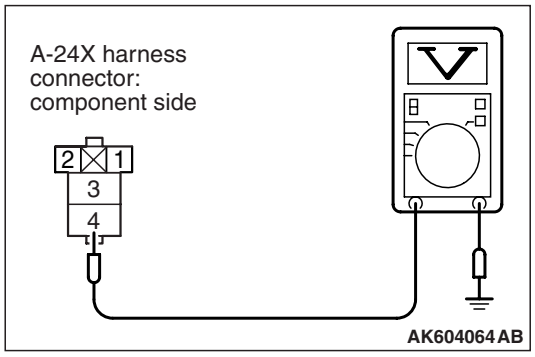
(2) Measure the resistance between connector A-24X (terminal No. 1) and ground.
- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Then go to Step 8.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.





STEP 8. Measure the power supply voltage at starter relay connector A-24X.

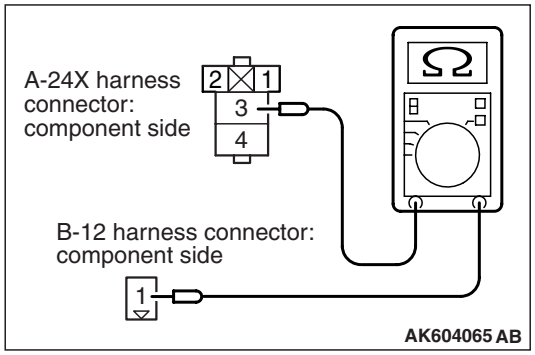
(1) Disconnect the connector A-24X measure at the harness side.

(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

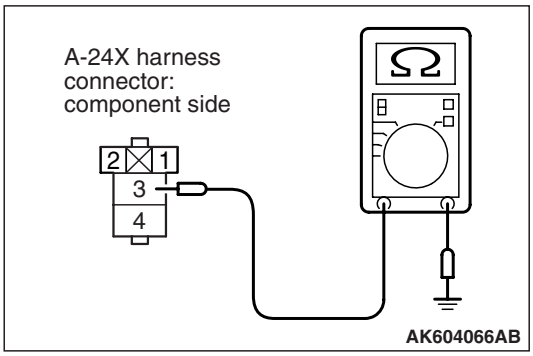
NO : Repair harness wire between starter relay connector A-24X (terminal No. 4) and fusible link (24) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check for open circuit or short circuit to ground or harness damage between starter relay connector A-24X and starter motor connector B-12.

(1) Disconnect the connector A-24X and B-12 measure at the harness side.

(2) Measure the resistance between connector A-24X (terminal No. 3) and connector B-12 (terminal No. 1).
- Should be less than 2 ohms.



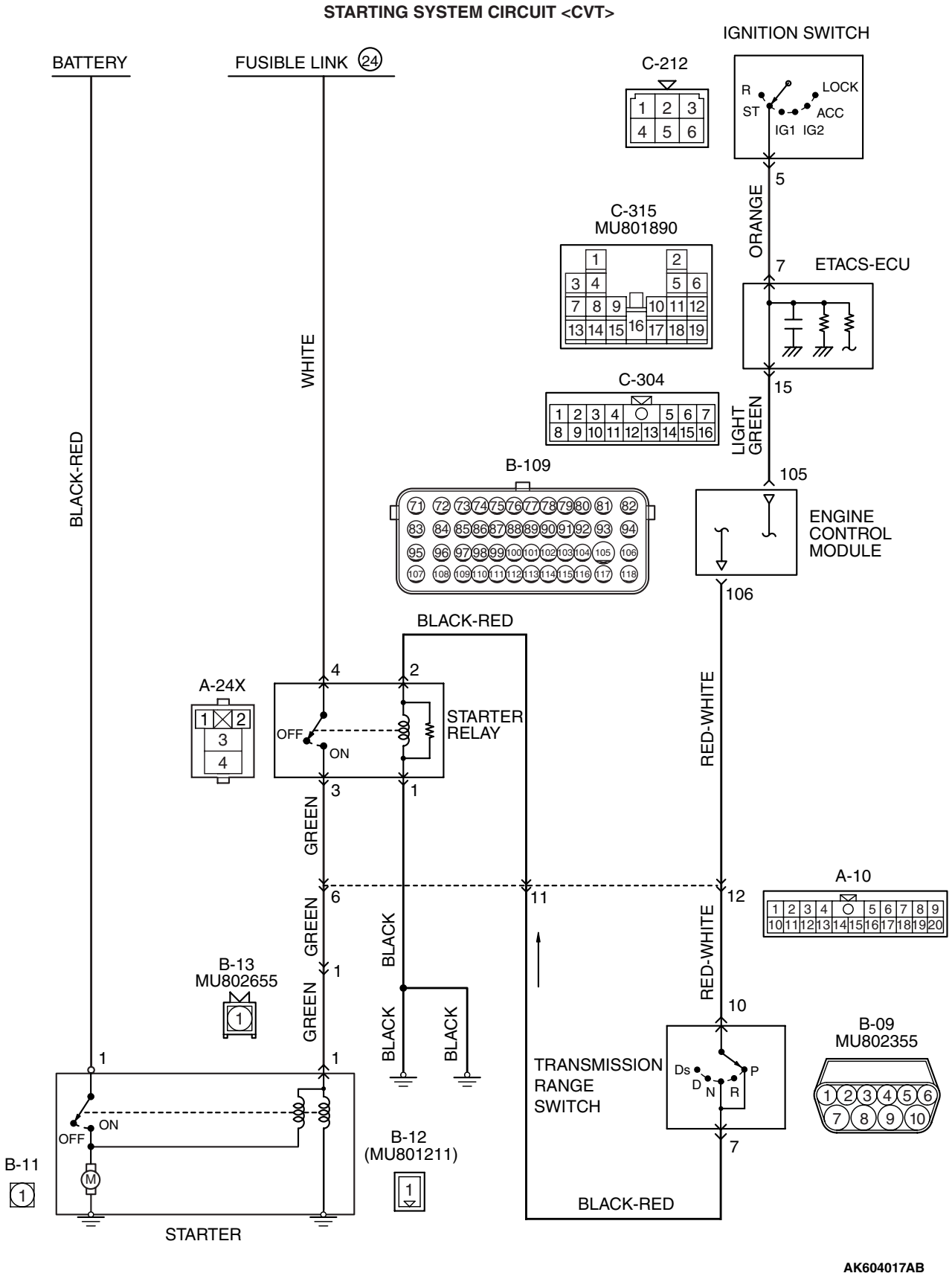
(3) Check for the continuity between connector A-24X (terminal No. 3) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Replace the starter motor. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 24: Ignition switch-ST system and starter relay system <CVT>



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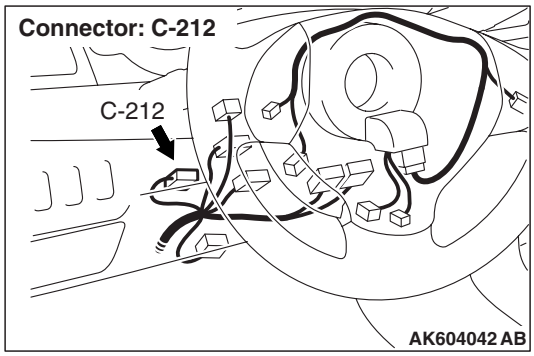
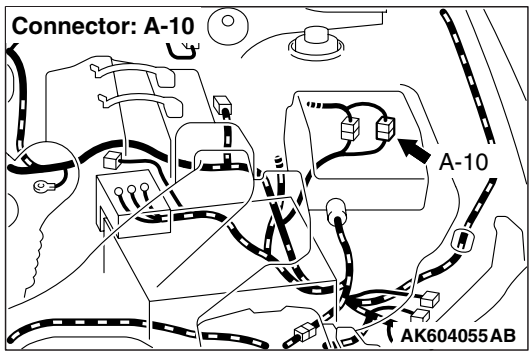
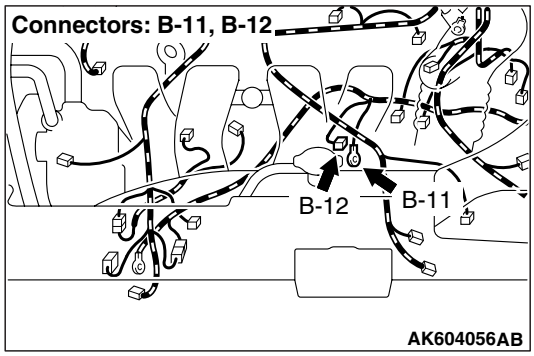
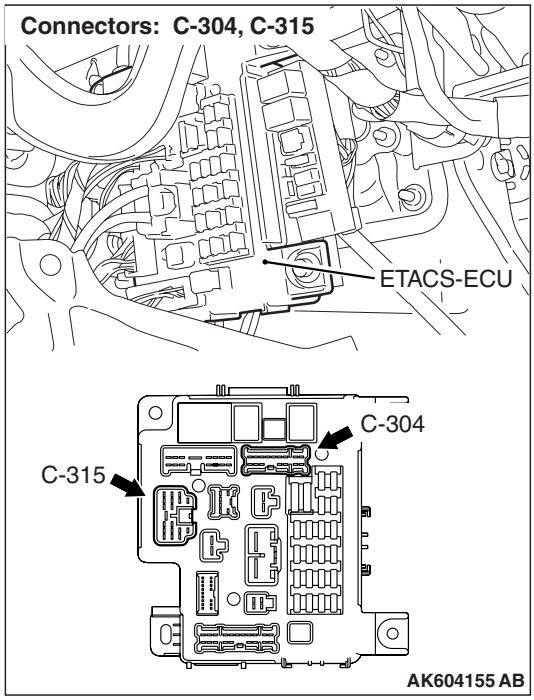
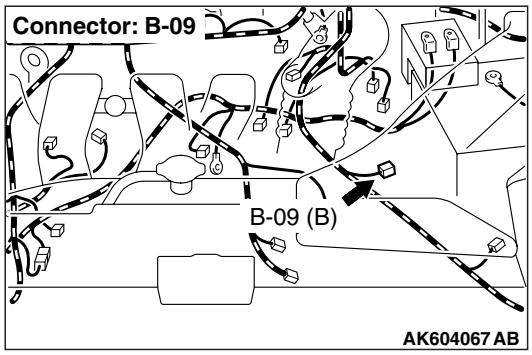
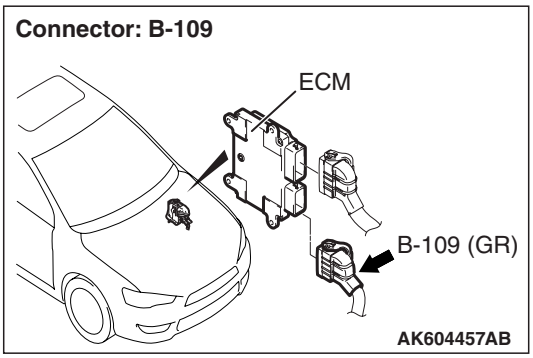


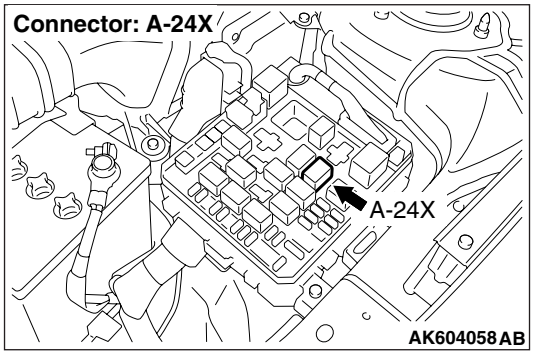












TSB Revision

CIRCUIT OPERATION

- If the selector lever is moved to "P" or "N" range and the ignition switch is turned to "START" position, battery positive voltage is supplied to starter relay coil. With this, the starter relay turns "ON" the battery positive voltage is supplied to the starter motor (terminal No. 1) from the battery.

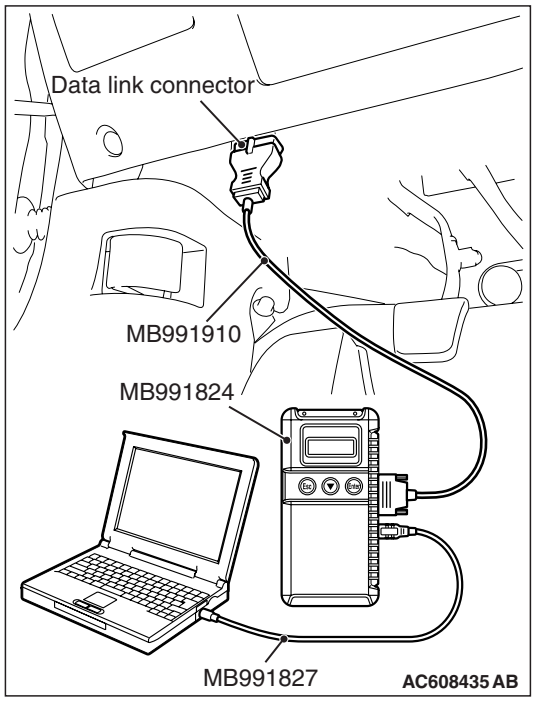
COMMENT

- Faulty starting system and the related circuit are suspected to be the causes.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Battery failed
- Malfunction of the starter motor relay.
- Malfunction of the starter motor.
- Open circuit or short circuit in the starting system or the related circuit or poor contact in the connectors
- Malfunction of the transmission range switch.
- Malfunction of the ECM

DIAGNOSIS



STEP 1. Using scan tool MB991958, check data list.

(1) Turn the ignition switch to the "ON" position.
(2) Check the following items of the data list. Refer to Data List Reference Table P.13A-879.
  a. Item 79: Cranking signal.
(3) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the sensor operating properly?

YES : Go to Step 2.
NO : Repair harness wire between ETACS-ECU connector C-304 (terminal No. 15) and ECM connector B-109 (terminal No. 105) because of open circuit. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check harness connector B-09 at transmission range switch and harness connector B-109 at ECM for damage.

Q: Is the connector in good condition?

YES : Go to Step 3.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the transmission range switch.

Refer to GROUP 23A, On-vehicle Service –Essential Service – Transmission Range Switch Continuity Check P.23A-137.

Q: Are there any abnormalities?

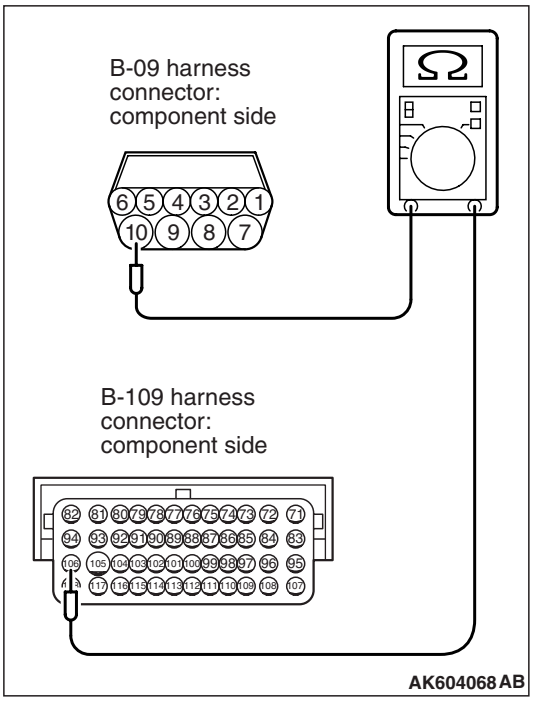
YES : Repair or replace it. Then confirm that the malfunction symptom is eliminated.
NO : Go to Step 4.

TSB Revision

STEP 4. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-09 and ECM connector B-109.

(1) Disconnect the connector B-09 and B-109 measure at the harness side.

(2) Measure the resistance between connector B-09 (terminal No. 10) and connector B-109 (terminal No. 106).
- Should be less than 2 ohms.

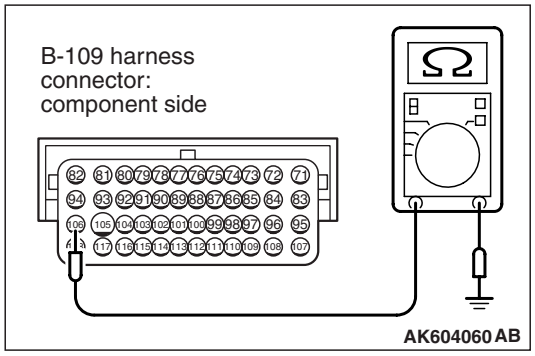


(3) Check for the continuity between connector B-109 (terminal No. 106) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Then go to Step 5.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.



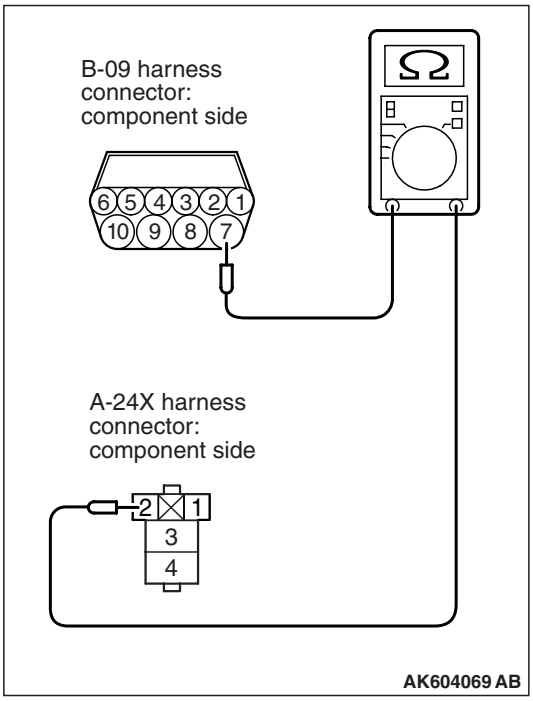
STEP 5. Check harness connector A-24X at starter relay.

Q: Is the connector in good condition?

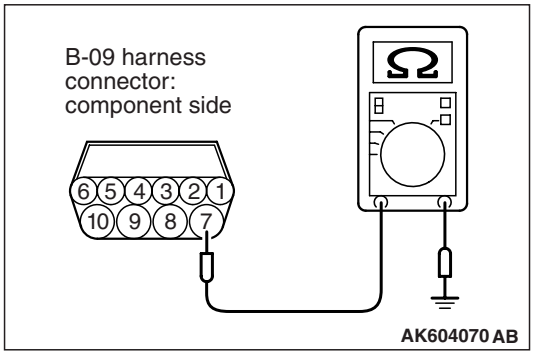
YES : Then go to Step 6.

NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 6. Check for open circuit or short circuit to ground or harness damage between transmission range switch connector B-09 and starter relay connector A-24X.



(1) Disconnect the connector B-09 and A-24X measure at the harness side.
(2) Measure the resistance between connector B-09 (terminal No. 7) and connector A-24X (terminal No. 2).
- Should be less than 2 ohms.

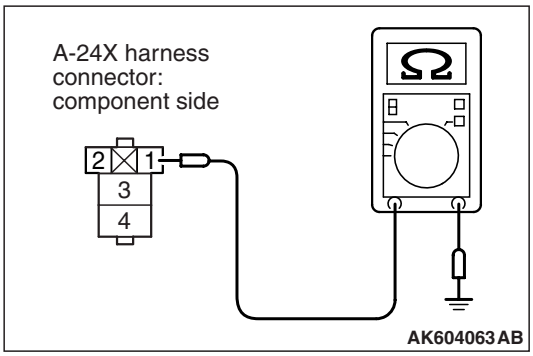


(3) Check for the continuity between connector B-09 (terminal No. 7) and ground.
- Not continuity.

Q: Is the harness wire in good condition?

YES : Then go to Step 7.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

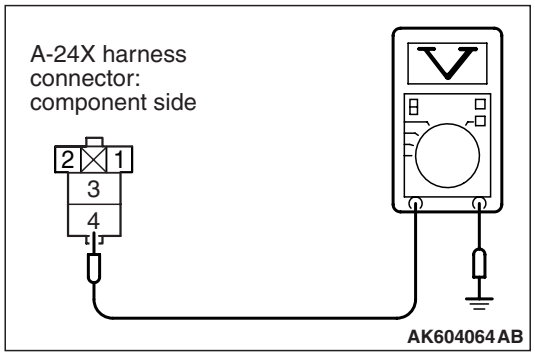
STEP 7. Check for open circuit or harness damage between starter relay connector A-24X and ground.



(1) Disconnect the connector A-24X and ground at the harness side.
(2) Measure the resistance between connector A-24X (terminal No. 1) and ground.
- Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Then go to Step 8.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 8. Measure the power supply voltage at starter relay connector A-24X.

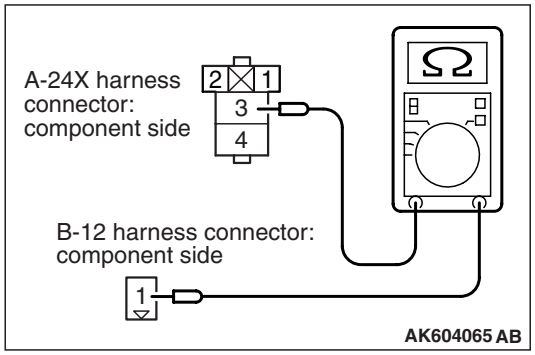
(1) Disconnect the connector A-24X measure at the harness side.

(2) Measure the voltage between terminal No. 4 and ground.
- Voltage should be battery positive voltage.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 9.

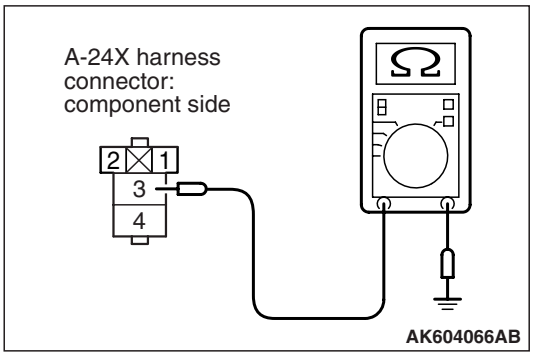
NO : Repair harness wire between starter relay connector A-24X (terminal No. 4) and fusible link (24) because of open circuit. Then confirm that the malfunction symptom is eliminated.



STEP 9. Check for open circuit or short circuit to ground or harness damage between starter relay connector A-24X and starter motor connector B-12.

(1) Disconnect the connector A-24X and B-12 measure at the harness side.

(2) Measure the resistance between connector A-24X (terminal No. 3) and connector B-12 (terminal No. 1).
- Should be less than 2 ohms.



(3) Check for the continuity between connector A-24X (terminal No. 3) and ground.
- Not continuity.

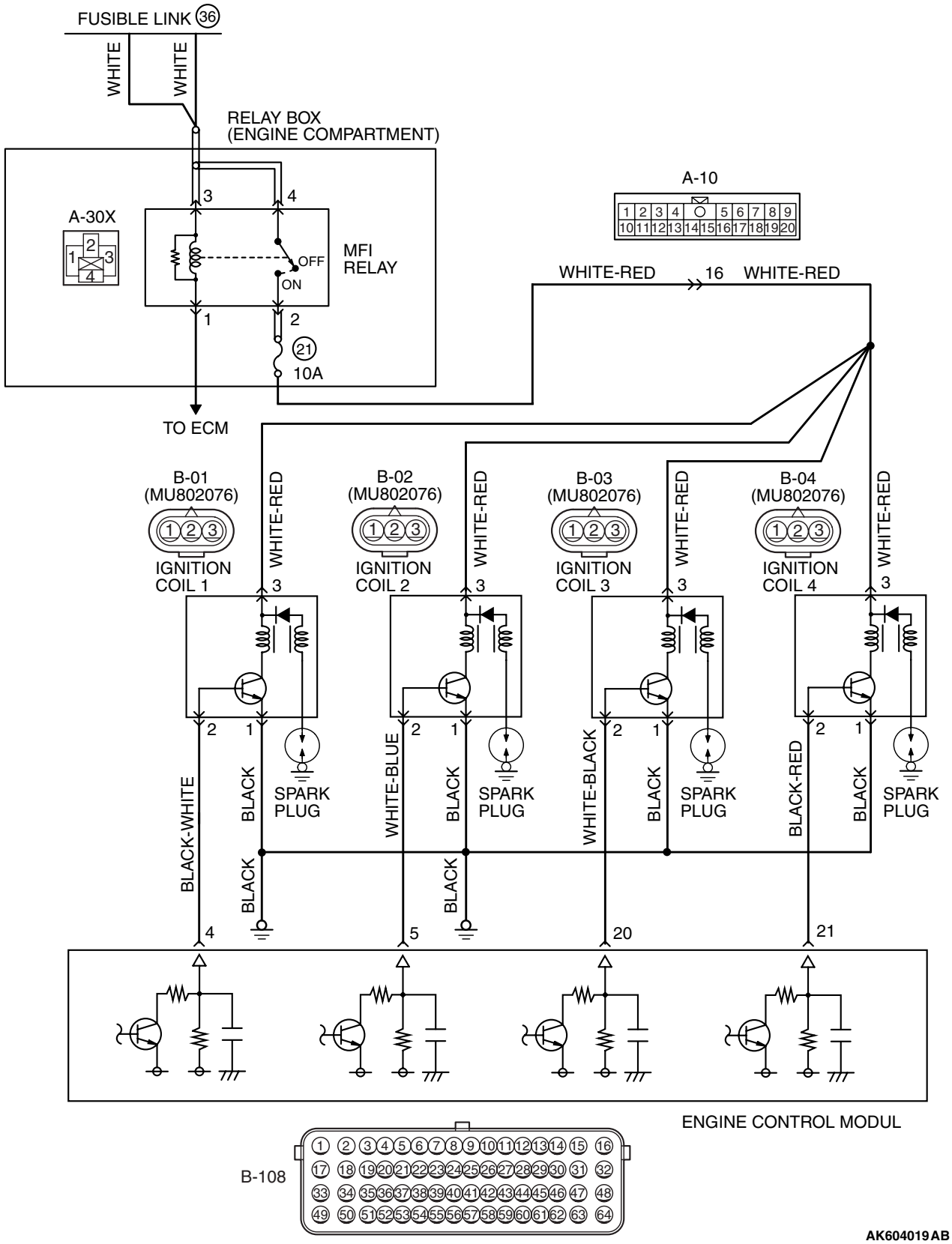
Q: Is the harness wire in good condition?

YES : Replace the starter motor. Then confirm that the malfunction symptom is eliminated.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 25: Ignition circuit system

IGNITION CIRCUIT



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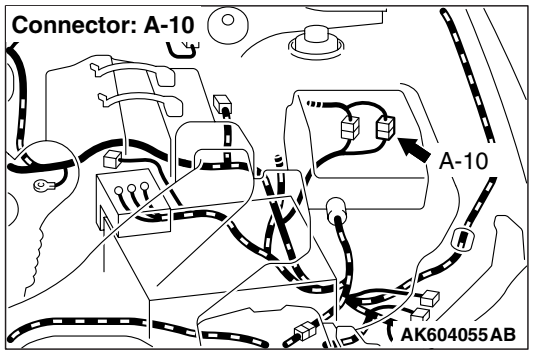
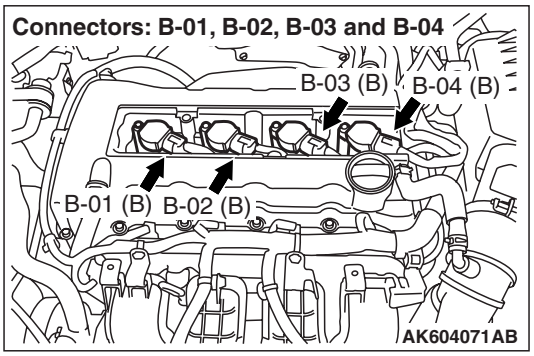
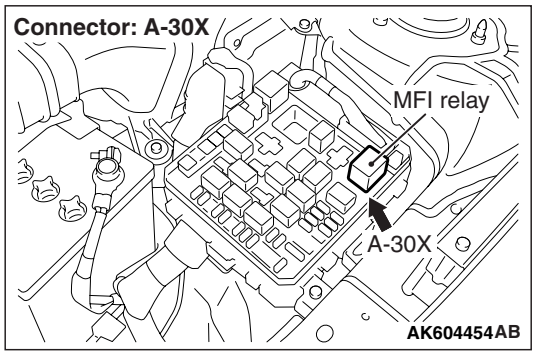
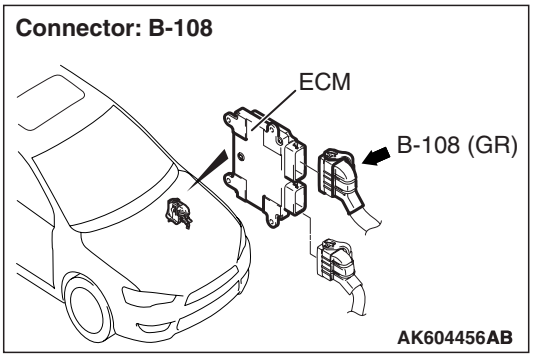








CIRCUIT OPERATION

- The battery positive voltage is applied from the MFI relay to the ignition coil (terminal No.3) and is grounded to the vehicle body via the ignition coil (terminal No.1).
- A power voltage of 12 V is applied to the ignition coil (terminal No. 3) from the ECM (terminal No. 4, No. 5, No. 20 and No. 21).

COMMENT

- When the ECM turn the power transistor in the unit to OFF, the battery positive voltage is applied to the power transistor in the ignition coil, resulting that the power transistor is ON. And, when the ECM turns the power transistor in the unit to ON, the power transistor in the ignition coil will be turned OFF.
- When the power transistor in the ignition coil is turned to ON with any signal from the ECM, the primary voltage will be applied through the ignition coil.When the power transistor in the ignition coil is turned OFF, the primary current is blocked and high voltage is generated in the secondary coil.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the ignition coil.
- Improper connector contact, open circuit or short-circuit harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Check the ignition coil.

Refer to GROUP 16, Ignition System –On-vehicle service –Ignition Coil Check P.16-36.

Q: Are there any abnormalities?

YES : Replace the ignition coil. Then confirm that the malfunction symptom is eliminated.

NO : Go to Step 2.

STEP 2. Check harness connectors harness connector B-108 at ECM and harness connector A-30X at MFI relay and B-01, B-02, B-03, B-04 at ignition coil for damage.

Q: Is the harness connector in good condition?

YES : Go to Step 3.

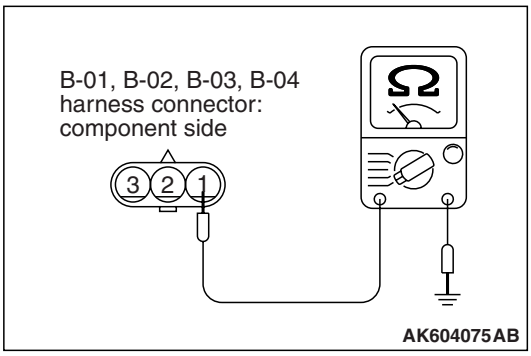
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

STEP 3. Check the continuity at ignition coil connectors B-01, B-02, B-03 and B-04.

(1) Disconnect the connector B-01, B-02, B-03 and B-04 measure at the harness side.

(2) Check for the continuity between terminal No. 1 and ground.

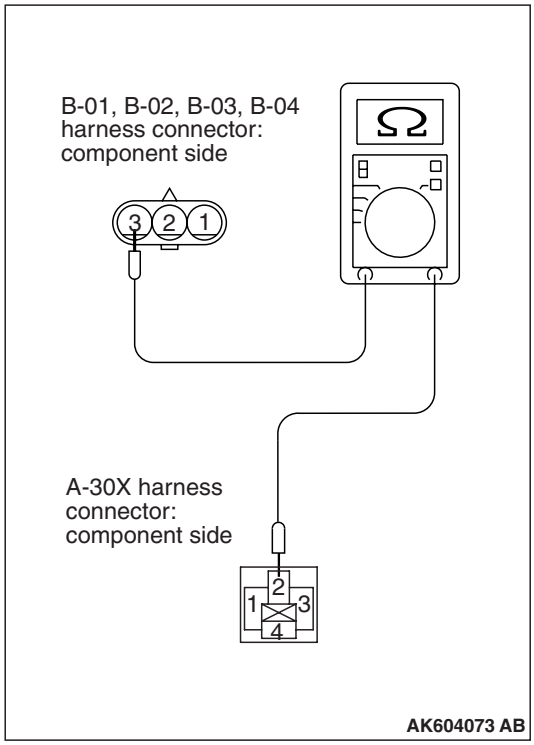
- Should be less than 2 ohms.



Q: Does continuity exist?

YES : Go to Step 4.

NO : Repair harness wire between ignition coil connector ignition coil connectors B-01, B-02, B-03 and B-04 (terminal No. 1) and ground because of open circuit or harness damage. Then confirm that the malfunction symptom is eliminated.



STEP 4. Check for open circuit and harness damage between MFI relay connector and ignition coil connector.

NOTE: Check harness after checking intermediate connector A-10. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the MFI relay connector and ignition coil connector.

(2) Measure the resistance between MFI relay connector and ignition coil connector.

a. MFI relay connector A-30X (terminal No. 2) and ignition coil connector B-01 (terminal No. 3) at ignition coil 1.

b. MFI relay connector A-30X (terminal No. 2) and ignition coil connector B-02 (terminal No. 3) at ignition coil 2.

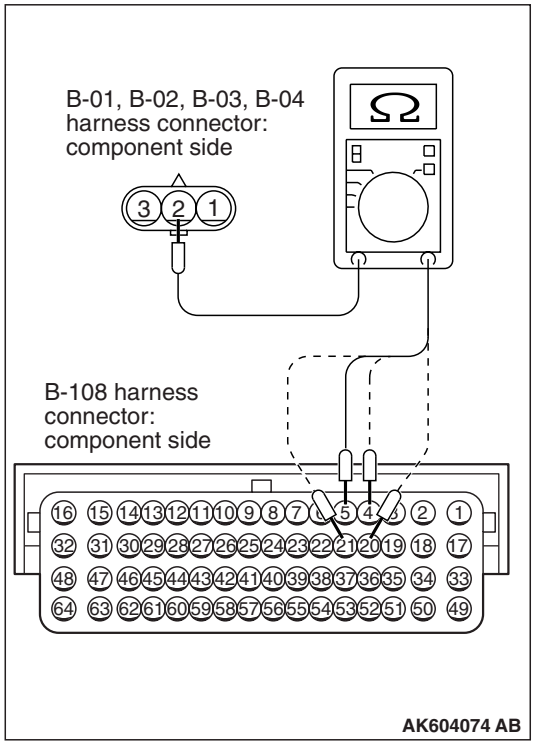
c. MFI relay connector A-30X (terminal No. 2) and ignition coil connector B-03 (terminal No. 3) at ignition coil 3.

d. MFI relay connector A-30X (terminal No. 2) and ignition coil connector B-04 (terminal No. 3) at ignition coil 4.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 5.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

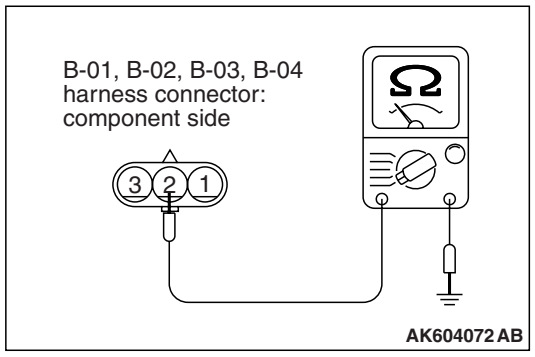


STEP 5. Check for open circuit and harness damage between ignition coil connector and ECM connector.

(1) Disconnect the ignition coil connector and ECM connector.
(2) Measure the resistance between ignition coil connector and ECM connector.
   a. Ignition coil connector B-01 (terminal No. 2) and ECM connector B-108 (terminal No. 4) at ignition coil 1.
   b. Ignition coil connector B-02 (terminal No. 2) and ECM connector B-108 (terminal No. 5) at ignition coil 2.
   c. Ignition coil connector B-03 (terminal No. 2) and ECM connector B-108 (terminal No. 20) at ignition coil 3.
   d. Ignition coil connector B-04 (terminal No. 2) and ECM connector B-108 (terminal No. 21) at ignition coil 4.
      - Should be less than 2 ohms.

Q: Is the measured resistance less than 2 ohms?

YES : Go to Step 6.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.



STEP 6. Check for short circuit to ground between ignition coil connector and ECM connector.

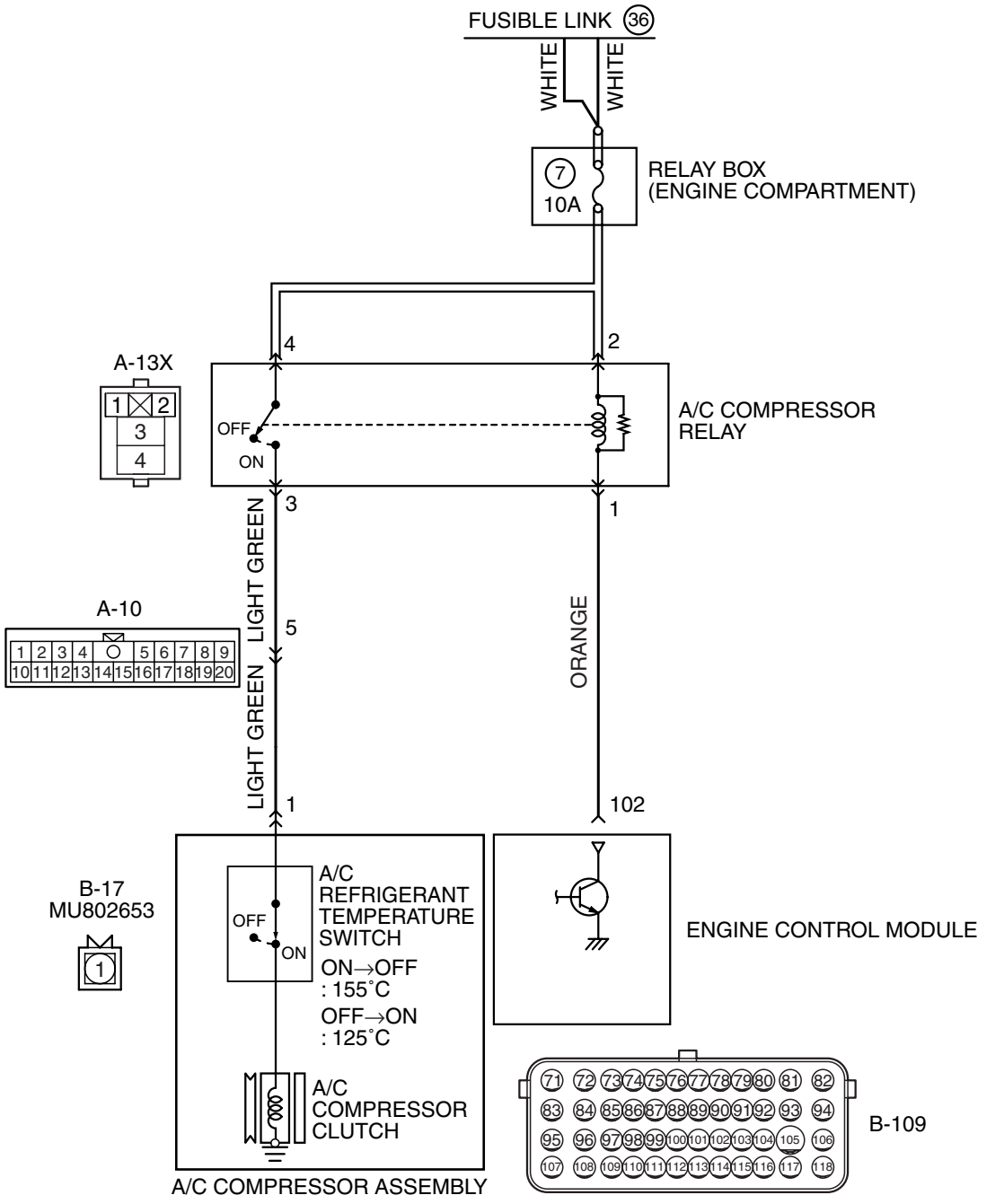
(1) Disconnect the ignition coil connector and ECM connector.
(2) Check for the continuity between ignition coil connector and ground.
   a. Ignition coil connector B-01 (terminal No. 2) and ground at ignition coil 1.
   b. Ignition coil connector B-02 (terminal No. 2) and ground at ignition coil 2.
   c. Ignition coil connector B-03 (terminal No. 2) and ground at ignition coil 3.
   d. Ignition coil connector B-04 (terminal No. 2) and ground at ignition coil 4.
      - Not continuity.

Q: Is the harness wire in good condition?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : Repair it. Then confirm that the malfunction symptom is eliminated.

Inspection procedure 26: A/C system

A/C COMPRESSOR RELAY CIRCUIT



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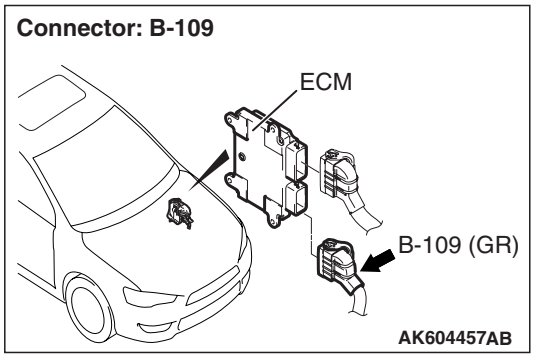
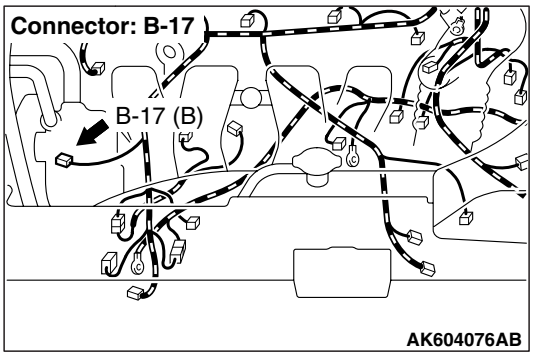
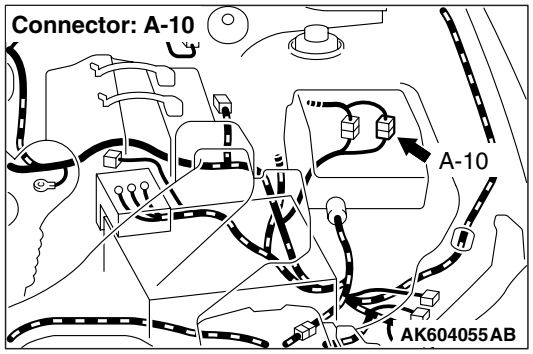
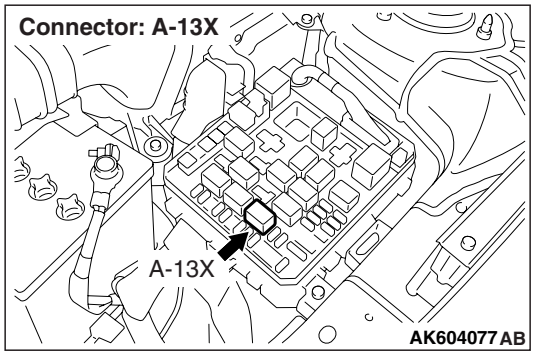








CIRCUIT OPERATION

- When the A/C switch ON signal is input into the ECM, the ECM turns ON the A/C compressor relay. This causes battery positive voltage to be supplied to the A/C compressor and the magnet latch actuates.

COMMENT

- When the A/C is "ON" the ECM turns "ON" the power transistor in the ECM. The ECM delays A/C engagement momentarily while it increases idle r/min. Then the A/C compressor clutch relay coil will be energized.

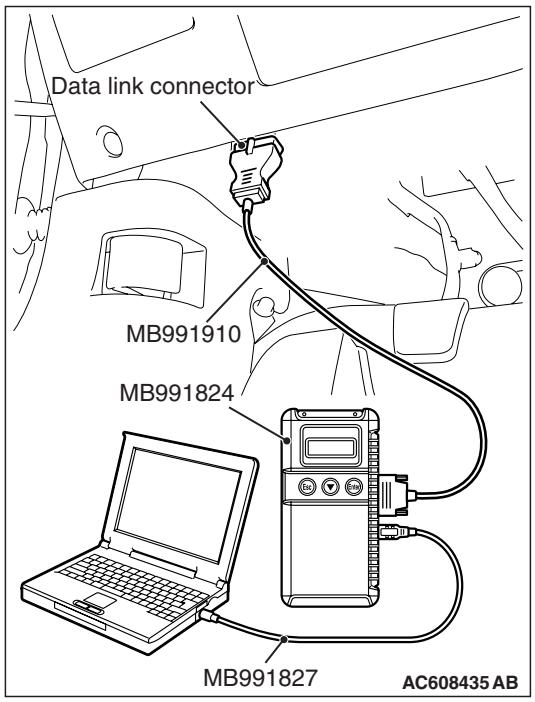
With this, the A/C compressor clutch relay turns "ON", and the A/C compressor clutch operates.

TROUBLESHOOTING HINTS (The most likely causes for this case:)

- Malfunction of the A/C control system.
- Improper connector contact, open circuit or short-circuited harness wire.
- Malfunction of the ECM.

DIAGNOSIS

STEP 1. Using scan tool MB991958, check data list item.



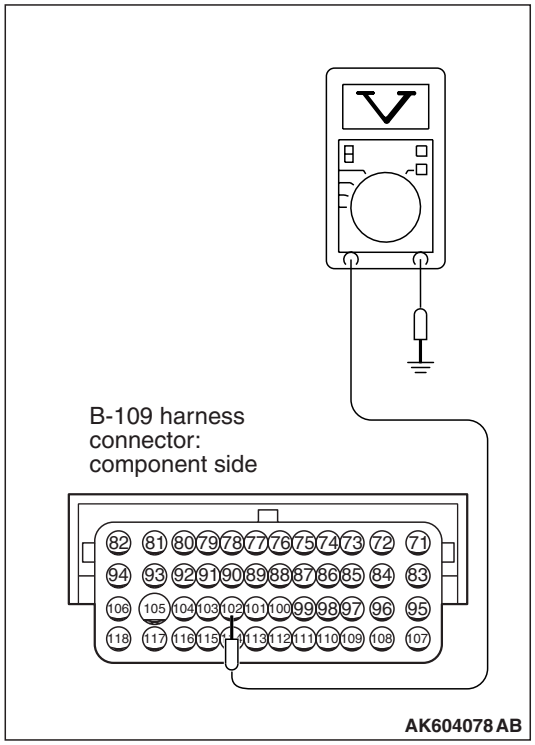
⚠ CAUTION
To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

(1) Connect scan tool MB991958 to the data link connector.
(2) Turn the ignition switch to the "ON" position.
(3) Check the following items in the data List.
Refer to Data List Reference Table P.13A-879.
a. Item 93: A/C compressor relay.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Are they operating properly?

YES : Go to Step 2.
NO : Repair or replace it. Then confirm that the malfunction symptom is eliminated.

STEP 2. Check the circuit at ECM connector B-109.



(1) Disconnect the connectors B-109 and measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 102 and ground.
• Voltage should be battery positive voltage.
(4) Using a jumper wire, connect terminal No. 102 to ground.
• A/C compressor clutch relay should turn "ON".
(5) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is the voltage and A/C compressor relay condition normal?

YES : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.
NO : Refer to GROUP 55A, Manual A/C Diagnosis – Heater, Air Conditioning and Ventilation Diagnostic Troubleshooting Strategy P.55A-5, or GROUP 55B, Auto A/C Diagnosis –Automatic A/C Troubleshooting Strategy P.55B-4.

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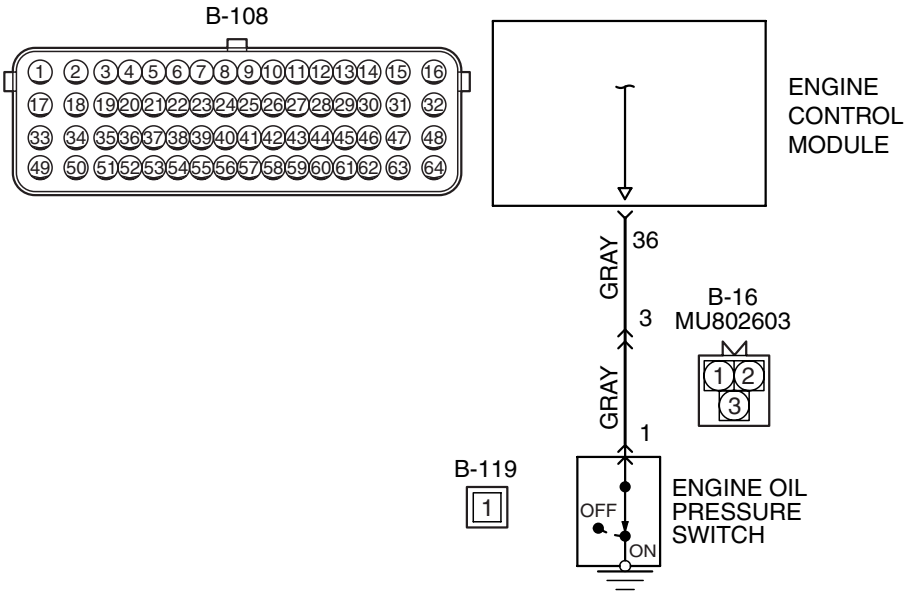
Inspection procedure 27: Engine oil pressure switch system

ENGINE OIL PRESSURE SWITCH CIRCUIT



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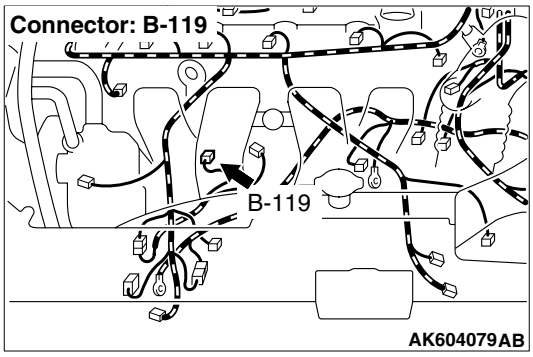

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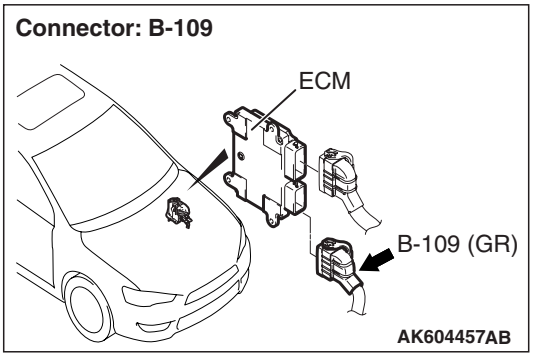

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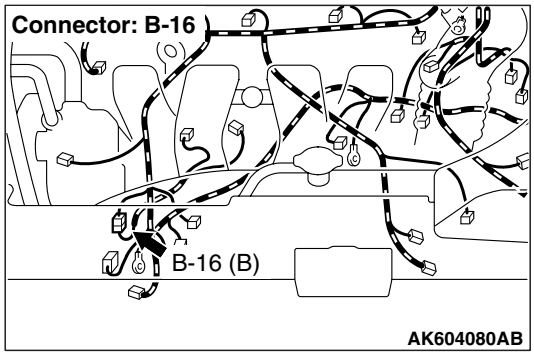

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CIRCUIT OPERATION

- Battery voltage is applied to the oil pressure switch (terminal No. 1) from the engine-ECU (terminal No. 36).

TSB Revision

COMMENT

- Detect the engine oil pressure conditions and enter the result into the ECM. After starting the engine if the oil pressure rises to higher than the given pressure, the engine oil pressure switch turns OFF. Under this condition the ECM sends the command of turning off the oil warning lamp to the combination meter via CAN.

TROUBLESHOOTING HINTS (The most likely causes for this code to be set are:)

- Engine oil pressure switch failed.
- Improper connector contact, open circuit or short-circuit harness wire.
- ECM failed.

DIAGNOSIS

Required Special Tools:

- MB991958: Scan Tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A

STEP 1. Check harness connector B-119 at engine oil pressure switch and harness connector B-108 at ECM for damage.

NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

Q: Is the harness connector in good condition?

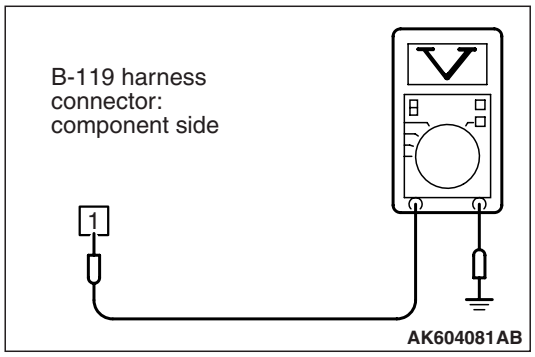
YES : Go to Step 2.
NO : Repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then go to Step 5.

STEP 2. Measure the power supply voltage at engine oil pressure switch connector B-119.

(1) Disconnect the connector B-119 measure at the harness side.
(2) Turn the ignition switch to the "ON" position.
(3) Measure the voltage between terminal No. 1 and ground.
  - The voltage should equal battery positive voltage.
(4) Turn the ignition switch to the "LOCK" (OFF) position.

Q: Is battery positive voltage (approximately 12 volts) present?

YES : Go to Step 5.
NO : Go to Step 3.

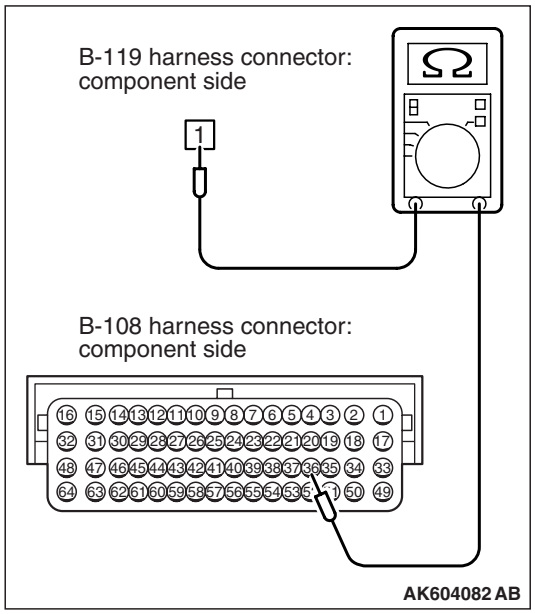


STEP 3. Check for open circuit or short circuit to ground or harness damage between engine oil pressure switch connector B-119 and ECM connector B-108.

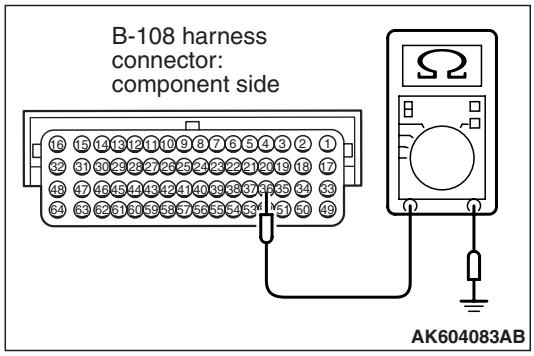
NOTE: Check harness after checking intermediate connector B-16. If intermediate connector is damaged, repair or replace it. Refer to GROUP 00E, Harness Connector Inspection P.00E-2. Then confirm that the malfunction symptom is eliminated.

(1) Disconnect the connector B-119 and B-108 measure at the harness side.

(2) Measure the resistance between connector B-119 (terminal No. 1) and connector B-108 (terminal No. 36).
- Should be less than 2 ohms.



(3) Check for the continuity between connector B-108 (terminal No. 36) and ground.
- Not continuity.

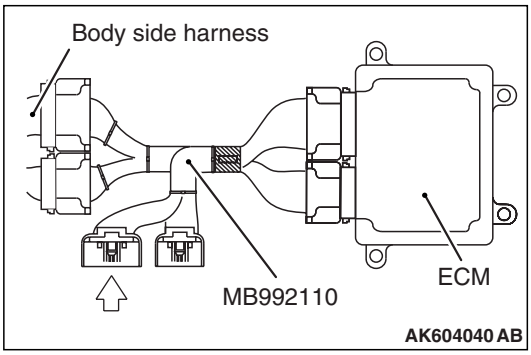


Q: Is the harness wire in good condition?

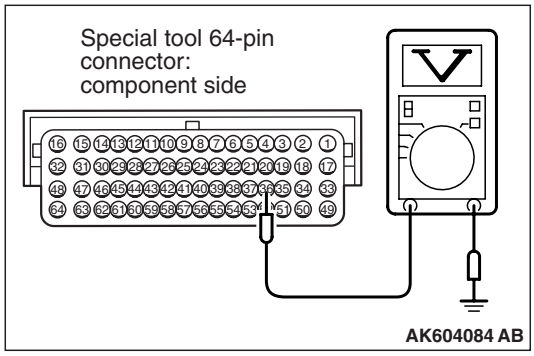
YES : Then go to Step 4.

NO : Repair it. Then confirm that the malfunction symptom is eliminated.

STEP 4. Measure the voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



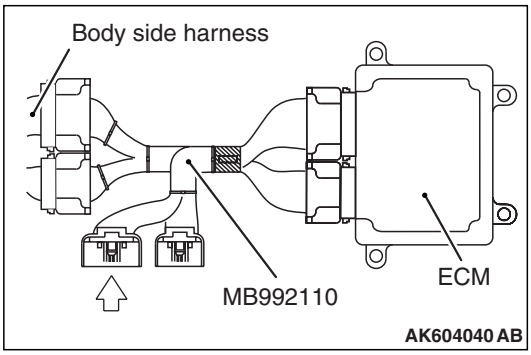
(2) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
System voltage (during idling)

Q: Is the measured voltage normal?

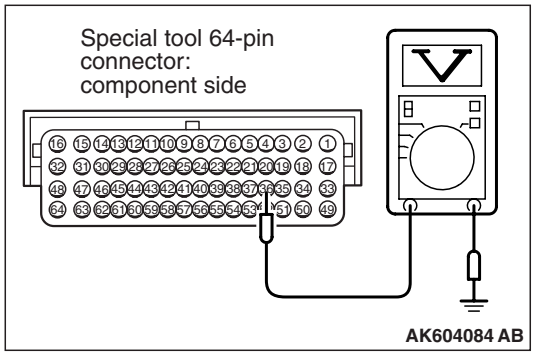
YES : It can be assumed that this malfunction is intermittent.Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the ECM. When the ECM is replaced, register the ID code. Refer to GROUP 42B, ID Code Registration Necessity Judgment Table <Vehicles with KOS> P.42B-13 or GROUP 42C, ID Codes Registration Judgment Table <Vehicles with WCM> P.42C-8.

STEP 5. Measure the voltage at ECM connector B-108 by using power plant ECU check harness special tool MB992110.



(1) Disconnect all ECM connectors. Connect the power plant ECU check harness special tool MB992110 between the separated connectors.



(2) Measure the voltage between terminal No. 36 and ground.
OK:
1 V or less (ignition switch: ON)
10 V or more (during idling)

Q: Is the measured voltage normal?

YES : It can be assumed that this malfunction is intermittent.Refer to GROUP 00, How to Use Troubleshooting/Inspection Service Points –How to Cope with Intermittent Malfunctions P.00-13.

NO : Replace the engine oil pressure switch. Then confirm that the malfunction symptom is eliminated.

DATA LIST REFERENCE TABLE

M1131152002861

⚠ CAUTION

- **When shifting the selector lever to D range, the brakes should be applied so that the vehicle does not move forward.**
- **Driving tests always need two persons: one driver and one observer.**

*NOTE: *1: In a new vehicle [driven approximately 500 km (311 mile) or less], the mass airflow sensor output value is sometimes 10% higher than the standard value.*

*NOTE: *2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 volts.*

*NOTE: *3: In a new vehicle [driven approximately 500 km (311 mile) or less], the injector drive time is sometimes 10% longer than the standard time.*

*NOTE: *4: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but this is no problem for checks.*

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C compressor relay	93	A/C compressor relay	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 26	P.13A-871
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
A/C SW	76	A/C switch	• Engine: warming up, idling • A/C switch: "OFF"		OFF	Procedure No. 26	P.13A-871
			• Engine: warming up, idling • A/C switch: "ON"	A/C compressor clutch is not operating	OFF		
				A/C compressor clutch is operating	ON		
Absolute load value	72	Absolute load value	Engine: warming up	Engine idling	10 –20 %	–	–
				2,500 r/min	10 –20 %		
				Revving engine	Load value increases according to amount of revving.		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Airflow sensor	10	Mass airflow sensor*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF"*4 • Transaxle: Neutral (CVT: "P" range)	Engine is idling	1,350 –1,670 mV	–	–
				2,500 r/min	1,620 –2,020 mV		
				Engine is revved	Increase in response to revving		
Airflow sensor	AA	Mass airflow sensor*1	• Engine coolant temperature: 80 – 95°C (176 – 203°F) • Lights, electric cooling fan and all accessories: "OFF"*4 • Transaxele: Neutral (CVT: "P" range)	Engine is idling	1.3 –5.3 g/s	–	–
				2,500 r/min	5.0 –13.0 g/s		
				Engine is revved	Increases in response to revving		
APP sensor (main)	11	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	900 –1,100 mV	Code No. P2122, P2123	P.13A-722, P.13A-728
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	4,000 mV or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
APP sensor (main)	BE	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	18 –22 %	Code No. P2122, P2123	P.13A-722, P.13A-728
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	80 % or more		
APP sensor (sub)	12	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	400 –600 mV	Code No. P2127, P2128	P.13A-762, P.13A-764
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	2,000 mV or more		
APP sensor (sub)	BF	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	8 –12 %	Code No. P2127, P2128	P.13A-733, P.13A-739
				Depress the accelerator pedal gradually	Increases in response to the pedal depression stroke		
				Depress the accelerator pedal fully	40 % or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Barometric pressure sensor	BB	Barometric pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P2228, P2229	P.13A-762, P.13A-764
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
Brake light switch	74	Brake light switch	Ignition switch: "ON"	Depress the brake pedal fully	ON	–	–
				Release the brake pedal	OFF		
Calculated load value	73	Calculated load value	Engine: warming up	Engine: idling	10 % –20 %	–	–
				2,500 r/min	10 % –20 %		
Closed throttle position switch	84	Closed throttle position signal	Ignition switch: "ON"	Release the accelerator pedal	ON	–	–
				Depress the accelerator pedal fully	OFF		
Cranking signal	79	Cranking signal (ignition switch-ST)	Ignition switch: "ON"	Engine: stopped	OFF	Procedure No. 23 <M/T>, 24 <CVT>	P.13A-854 <M/T>, P.13A-860 <CVT>
				Engine: cranking	ON		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Crankshaft position sensor	02	Crankshaft position sensor	• Engine: cranking • Tachometer: connected		Engine speeds displayed on the scan tool and tachometer are identical.	Code No.P0335	P.13A-449
			Engine: idling	Engine coolant temperature is −20° C (−4° F)	1,400 –1,600 r/min		
				Engine coolant temperature is 0° C (32° F)	1,350 –1,550 r/min		
				Engine coolant temperature is 20° C (68° F)	1,200 –1,400 r/min		
				Engine coolant temperature is 40° C (104° F)	950 –1,150 r/min		
				Engine coolant temperature is 80° C (176° F)	600 –800 r/min		
ECT sensor	06	Engine coolant temperature sensor	Ignition switch: "ON" or with engine running	Engine coolant temperature is −20° C (−4° F)	−20° C (−4° F)	Code No. P0116, P0117, P0118	P.13A-187, P.13A-193, P.13A-198
				Engine coolant temperature is 0° C (32° F)	0° C (32° F)		
				Engine coolant temperature is 20° C (68° F)	20° C (68° F)		
				Engine coolant temperature is 40° C (104° F)	40° C (104° F)		
				Engine coolant temperature is 80° C (176° F)	80° C (176° F)		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
EGR step motor	31	EGR valve (stepper motor) <California>	• Engine coolant temperature: 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : "OFF"*4 • Transaxle: Neutral (CVT: "P" range)	Engine is idling	2 –8 Step	Code No. P0489, P0490	P.13A-582, P.13A-590
				2,500 r/min	2 –8 Step		
Engine control relay	95	Engine control relay	Ignition switch: "ON"		ON	–	–
Engine oil pressure switch	90	Engine oil pressure switch	Ignition switch: "ON"		ON	Procedure No. 27	P.13A-874
			Engine: idling		OFF		
ETV relay	96	Throttle actuator control motor relay	Ignition switch: "ON"		ON	–	–
EVAP. emission purge SOL. duty	49	Evaporative emission purge solenoid duty	Engine: warming up with Open loop drive condition, without EVAP leak monitor		1 % or more	–	–
Exhaust VVT angle (bank 1)	39	Exhaust MIVEC phase angle	Engine warming up, idle		-3 to 3° CA <Except for California> 0 to 6° CA <California>	Code No. P0011	P.13A-55
			Engine warming up, sudden racing		Increase	Code No. P0014	P.13A-58
Fan duty	47	Fan motor duty	Engine: warming up • The duty ratio of the fan motor driving is shown.		0 –100 % (Display range)	–	–
Fuel level gauge	51	Fuel level gauge	Ignition switch: "ON" • The residual fuel amount in the tank is shown. • "0 %" means "Empty" and "100 %" means "Full".		0 –100 % (Display range)	–	–

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Fuel pump relay	97	Fuel pump relay	Ignition switch: "ON"		OFF	–	–
			Engine: cranking		ON		
Fuel system status (bank 1)	105	Fuel control system status	Engine: warming up	2,500 r/min	CL: Using O2S	–	–
				When engine is suddenly revved	OL: DRV condition		
Fuel tank differential PRS. SNSR	52	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1,500 –3,500 mV	–	–
Fuel tank temperature sensor	53	Fuel tank temperature sensor	• In cooled state • Ignition switch: "ON"		Approximately the same as the outdoor temperature	Code No. P0181, P0182, P0183	P.13A-348, P.13A-355, P.13A-360
Ignition switch	85	Ignition switch (IG1)	Ignition switch: "ON"		ON	–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Injectors	17	Injectors*2	Engine: cranking	When engine coolant temperature is 0° C (32° F)	74 –94 ms	–	–
				When engine coolant temperature is 20° C (68° F)	26.9 –46.9 ms		
				When engine coolant temperature is 80° C (176° F)	7 –13 ms		
		Injectors*3	• Engine coolant temperature: 80 – 95° C (176 – 203° F) • Lights, electric cooling fan and all accessories : "OFF" • Transaxle: Neutral (CVT: "P" range)	Engine is idling	1.3 –3.3 ms		
				2,500 r/min	1.0 –3.0 ms		
				When engine is suddenly revved	Increases		
Intake air temperature sensor	5	Intake air temperature sensor	Ignition switch: "ON" or with engine running	Intake air temperature is -20° C (-4° F)	-20° C (-4° F)	Code No. P0111, P0112, P0113	P.13A-171, P.13A-177, P.13A-181
				Intake air temperature is 0° C (32° F)	0° C (32° F)		
				Intake air temperature is 20° C (68° F)	20° C (68° F)		
				Intake air temperature is 40° C (104° F)	40° C (104° F)		
				Intake air temperature is 80° C (176° F)	80° C (176° F)		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Intake VVT angle (bank 1)	36	Intake MIVEC phase angle	Engine warming up, idle	-3 to 3° CA <Except for California> -6 to 0° CA <California>	Code No. P0011	P.13A-55
			Engine warming up, sudden racing	Decreased	Code No. P0014	P.13A-58
ISC learned value (A/C OFF)	68	Idle speed control learned value (A/C OFF)	Ignition switch: "ON" • Indicates the leaning value to compensate for the opening angle of idling speed control (opening angle of throttle valve). • The negative side shows "close" side, while the positive side shows "open" side.	-1 to 2.4 L/s (Display range)	–	–
ISC learned value (A/C ON)	69	Idle speed control learned value (A/C ON)	Ignition switch: "ON" • Indicates the leaning value to compensate for the opening angle of idling speed control (opening angle of throttle valve) with the air conditioner turned ON. • The negative side shows "close" side, while the positive side shows "open" side.	-1 to 2.4 L/s (Display range)	–	–
Knock retard	32	Knock retard	Engine: warming up, sudden racing	According to acceleration, knock retard is increased.	–	–
Learned knock retard	33	Knock control learned value	Ignition switch: "ON" • The learning value is shown, which compensates the ignition time based on the knock sensor. • "0 %" means "retard angle" and "100 %" means "advance angle".	0 –100 % (Display range)	–	–
Long term fuel trim (bank 1)	26	Long-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)	–12.5 to 12.5 %	Code No. P0171, P0172	P.13A-336, P.13A-342

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
MAP sensor	8	Manifold absolute pressure sensor	Ignition switch: "ON"	Engine stopped [At altitude of 0 m (0 ft.)]	101 kPa (29.8 in.Hg)	Code No. P0106, P0107, P0108	P.13A-149, P.13A-158, P.13A-166
				Engine stopped [At altitude of 600 m (1,969 ft.)]	95 kPa (28.1 in.Hg)		
				Engine stopped [At altitude of 1,200 m (3,937 ft.)]	88 kPa (26.0 in.Hg)		
				Engine stopped [At altitude of 1,800 m (5,906 ft.)]	81 kPa (23.9 in.Hg)		
			Engine: warming up, idling		16 –36 kPa (4.7 –10.6 in.Hg)		
			When engine is suddenly revved		Manifold pressure varies		
Neutral switch	87	Neutral switch <CVT>	Ignition switch: "ON"	Shift lever: "P" or "N"	ON	–	–
				Shift lever: except "P" and "N"	OFF		
Normally closed brake switch	89	Normally closed brake switch	Ignition switch: "ON"	Depress the brake pedal	ON	–	–
				Release the brake pedal	OFF		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank1 sensor1)	AC	Heated oxygen sensor (front)	Engine: warming up (Air/fuel mixture is made leaner when decelerating and is made richer when revving)	When the engine is running at 4,000 r/min, decelerate suddenly.	0.2 V or less → 0.6 –1.0 V (After several seconds have elapsed)	Code No. P0131, P0132, P0133, P0134, P2195	P.13A-229, P.13A-245, P.13A-253, P.13A-263, P.13A-756 <Except for California> P.13A-237, P.13A-249, P.13A-258, P.13A-268, P.13A-759 <California>
				When engine is suddenly raced	0.6 –1.0 V		
			Engine: warming up (the heated oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECM.)	Engine is idling	Voltage changes repeatedly between 0.4 V or less and 0.6 –1.0 V.		
				2,500 r/min			

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Oxygen sensor (bank1 sensor2)	AD	Heated oxygen sensor (rear)	• Transaxle: 2 nd (5 positions CVT: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more		0.6 –1.0 V	Code No. P0137, P0138, P0139, P0140	P.13A-274, P.13A-292, P.13A-300, P.13A-308 <Except for California> P.13A-283, P.13A-296, P.13A-304, P.13A-312 <California>
Oxygen sensor (bank 1 sensor 3)	B1	Heated oxygen sensor (3rd) <California>	• Transaxle: 2nd (5 positions CVT: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more		0.6 –1.0 V	Code No. P0143, P0144, P0145, P0146	P.13A-316, P.13A-324, P.13A-328, P.13A-332
Power steering switch	83	Power steering pressure switch	Engine: idling	Steering wheel stationary	OFF	Code No.P0551	P.13A-611
				Steering wheel turning	ON		
Power supply voltage	01	Power supply voltage	Ignition switch: "ON"		Battery positive voltage	Procedure No. 21	P.13A-842

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Relative TP sensor	BC	Relative throttle position sensor	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0 –5 %	–	–
				Fully open the throttle valve with your finger	88 % or more		
Short term fuel trim (bank 1)	28	Short-term fuel trim	Engine: warming up, 2,500 r/min without any load (during closed loop)		–7.4 to 7.4 %	Code No. P0171, P0172	P.13A-336, P.13A-342
Spark advance	16	Ignition timing advance	• Engine: warming up • Timing light is set (to check actual ignition timing) • Transaxle: neutral (CVT: "P" range)	Engine is idling	2 –18° CA (BTDC)	–	–
				2,500 r/min	34 –46° CA (BTDC)		
Starter relay	102	Starter relay	Ignition switch: "ON"		OFF	Procedure No. 23 <M/T>, 24 <CVT>	P.13A-854 <M/T>, P.13A-860 <CVT>
			Engine: Cranking		ON		

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M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Target EGR	BA	Target EGR valve (stepper motor) <California>	• The target duty ratio of the EGR valve driving is shown. • "0 %" means "fully closed EGR valve" and "100 %" means "fully opened EGR valve".		0 –100 % (Display range)	–	–
Target ETV value	59	Throttle actuator control motor target value	Engine: warming up • The target opening degree of the throttle valve is shown. • "0 V" means "fully closed throttle valve" and "5 V" means "fully opened throttle valve".		0 –5 V (Display range)	–	–
Target idle speed	3	Target idle speed	Engine: idling	Engine coolant temperature is –20° C (–4° F)	1,400 –1,600 r/min	–	–
				Engine coolant temperature is 0° C (32° F)	1,350 –1,550 r/min		
				Engine coolant temperature is 20° C (68° F)	1,200 –1,400 r/min		
				Engine coolant temperature is 40° C (104° F)	950 –1,150 r/min		
				Engine coolant temperature is 80° C (176° F)	600 –800 r/min		
Throttle actuator	58	Throttle actuator control motor	Engine: warming up • The target opening degree of the throttle valve is shown. • "0 %" means "fully closed throttle valve" and "100 %" means "fully opened throttle valve".		0 –100 % (Display range)	–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (main)	AB	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	6 –14 %	Code No. P0122, P0123	P.13A-206, P.13A-213
				Fully open the throttle valve with your finger	80 % or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (main)	13	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	300 –700 mV	Code No. P0122, P0123	P.13A-206, P.13A-213
				Fully open the throttle valve with your finger	4,000 mV or more		
			Engine: warming up, idling	No load	500 –660 mV		
				A/C switch: "OFF" →"ON"	Voltage varies		
				Shift lever: "N" →"D"			
TP sensor (main) learned value	14	Throttle position sensor (main) mid opening learning value	This item shows the throttle valve opening learning value when the vehicle enters into the limp home mode.			–	–

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (sub)	BD	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminals numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	6 –14 %	Code No. P0222, P0223	P.13A-407, P.13A-413
				Fully open the throttle valve with your finger	80 % or more		

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
TP sensor (sub)	15	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	4,000 mV or more	Code No. P0222, P0223	P.13A-407, P.13A-413
				Fully open the throttle valve with your finger	1,000 mV or less		
Vehicle speed	4	Vehicle speed	Drive at 40 km/h (25 mph).		Approximately 40 km/h (25 mph)	–	–

GENERAL SCAN TOOL (GST) MODE 01 REFERENCE TABLE

M1131156000135

The purpose of this service of to allow access to current emission-related data values, including analogue inputs and outputs, digital inputs and outputs, and system status information.
The request for information includes a parameter identification (PID) value that indicates to the on-board system the specific information requested.
The ECM will respond to this message by transmitting the requested data value last determined by the system. All data values returned for sensor readings will be actual readings, not default or substitute values used by the system because of a fault with that sensor.

NOTE: GST MODE 01 can be accessed through the use of a general scan tool.

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	Number of emission-related DTCs and MIL status	DTC and MIL status:	–	
	Number of DTCs stored in this ECU	DTC_CNT: xxxd		
	Malfunction Indicator Lamp (MIL) status	MIL: OFF or ON		
	Supported tests which are continuous	Support status of continuous monitors:		
	Misfire monitoring	MIS_SUP: YES		
	Fuel system monitoring	FUEL_SUP: YES		
	Comprehensive component monitoring	CCM_SUP: YES		
	Status of continuous monitoring tests since DTC cleared	Completion status of continuous monitors since DTC cleared:		
	Misfire monitoring	MIS_RDY: YES or NO		
	Fuel system monitoring	FUEL_RDY: YES or NO		
	Comprehensive component monitoring	CCM_RDY: YES or NO		
	Supported tests run at least once per trip	Support status of non-continuous monitors:		
	Catalyst monitoring	CAT_SUP: YES		
	Heated catalyst monitoring	HCAT_SUP: NO		
	Evaporative system monitoring	EVAP_SUP: YES		
	Secondary air system monitoring	AIR_SUP: NO		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
01	A/C system refrigerant monitoring	ACRF_SUP: NO	–	
	Oxygen sensor monitoring	O2S_SUP: YES		
	Oxygen sensor heater monitoring	HTR_SUP: YES		
	EGR system monitoring	EGR_SUP: YES		
	Status of tests run at least once per trip	Completion status of non-continuous monitors since DTC cleared:		
	Catalyst monitoring	CAT_RDY: YES or NO		
	Heated catalyst monitoring	HCAT_RDY: YES		
	Evaporative system monitoring	EVAP_RDY: YES or NO		
	Secondary air system monitoring	AIR_RDY: YES		
	A/C system refrigerant monitoring	ACRF_RDY: YES		
	Oxygen sensor monitoring	O2S_RDY: YES or NO		
	Oxygen sensor heater monitoring	HTR_RDY: YES or NO		
	EGR system monitoring	EGR_RDY: YES or NO		
03	Fuel system 1 status	FUELSYS1: OL/CL/OL-Drive/OL-Fault/ CL-Fault	See M.U.T.-III item No. 105.	
	Fuel system 2 status	FUELSYS2: OL/CL/OL-Drive/OL-Fault/ CL-Fault	–	
04	Calculated LOAD Value	LOAD_PCT: xxx.x%	See M.U.T.-III item No. 73.	
05	Engine Coolant Temperature	ECT: xxx° C (xxx° F)	See M.U.T.-III item No. 6.	
06	Short Term Fuel Trim-Bank 1	SHRTFT1: xxx.x%	See M.U.T.-III item No. 28.	
07	Long Term Fuel Trim-Bank 1	LONGFT1: xxx.x%	See M.U.T.-III item No. 26.	
08	Short Term Fuel Trim-Bank 2	SHRTFT2: xxx.x%	–	
09	Long Term Fuel Trim-Bank 2	LONGFT2: xxx.x%	–	
0B	Intake Manifold Absolute Pressure	MAP: xxx kPa (xx.x inHg)	See M.U.T.-III item No. 8.	
0C	Engine RPM	RPM: xxxxx min $^{-1}$	See M.U.T.-III item No. 2.	
0D	Vehicle Speed Sensor	VSS: xxx km/h (xxx mph)	See M.U.T.-III item No. 4.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
0E	Ignition Timing Advance for #1 Cylinder	SPARKADV: xx°	See M.U.T.-III item No. 16.	
0F	Intake Air Temperature	IAT: xxx° C (xxx° F)	See M.U.T.-III item No. 5.	
10	Air Flow Rate from Mass Air Flow Sensor	MAF: xxx.xx g/s (xxxx.x lb/min)	See M.U.T.-III item No. AA.	
11	Absolute Throttle Position	TP: xxx.x%	See M.U.T.-III item No. AB.	
13	Location of Oxygen Sensor	O2SLOC: OxSxx	• Ignition switch: "ON"	O2S11/O2S12/O2S13/O2S21/O2S22
14	Bank 1 –Sensor 1	O2S11: x.xxx V	See M.U.T.-III item No. AC.	
		SHRTFT11: xxx.x%	Engine: warming up, 2,500 r/min without any load (during closed loop)	–25 to 25%
15	Bank 1 –Sensor 2	O2S12: x.xxx V	See M.U.T.-III item No. AD.	
18	Bank 2 –Sensor 1	O2S21: x.xxx V	–	
		SHRTFT21: xxx.x%	–	
19	Bank 2 –Sensor 2	O2S22: x.xxx V	–	
1C	OBD requirements to which vehicle is designed	OBDSUP: OBD II	Ignition switch: "ON"	OBD II
1F	Time Since Engine Start	RUNTM: xxxxx sec.	–	
21	Distance Travelled While MIL is Active	MIL DIST: xxxxx km (xxxxx miles)	–	
2C	Commanded EGR	EGR_PCT: xxx.x%	See M.U.T.-III item No. BA.	
2E	Commanded Evaporative Purge	EVAP_PCT: xxx.x%	See M.U.T.-III item No. 49.	
2F	Fuel Level Input	FLI: xxx.x%	See M.U.T.-III item No. 51.	
30	Number of warm-ups since diagnostic trouble codes cleared	WARM_UPS: xxx	–	
31	Distance since diagnostic trouble codes cleared	CLR_DIST: xxxxx km (xxxxx miles)	–	
32	Evap System Vapor Pressure	EVAP_VP: xxxx.xx Pa (xx.xxx in H2O)	• Ignition switch: "ON" • Fuel cap removal	–3.3 to 3.3 kPa (–13.4 to 13.4 in.H2O)
33	Barometric Pressure	BARO: xxx kPa (xx.x inHg)	See M.U.T.-III item No. BB.	

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Monitor status this driving cycle		–	
	Enable status of continuous monitors this monitoring cycle:	Enable status of continuous monitors this monitoring cycle: NO means disable for rest of this monitoring cycle or not supported in PID 01, YES means enable for this monitoring cycle.		
	Misfire monitoring	MIS_ENA: NO or YES		
	Fuel system monitoring	FUEL_ENA: NO or YES		
	Comprehensive component monitoring	CCM_ENA: YES		
	Completion status of continuous monitors this monitoring cycle:	Completion status of continuous monitors this monitoring cycle:		
	Misfire monitoring	MIS_CMPL: YES or NO		
	Fuel system monitoring	FUEL_CMPL: YES or NO		
	Comprehensive component monitoring	CCM_CMPL: YES or NO		
	Enable status of non-continuous monitors this monitoring cycle:	Enable status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring	CAT_ENA: YES or NO		
	Heated catalyst monitoring	HCAT_ENA: NO		
	Evaporative system monitoring	EVAP_ENA: YES or NO		
	Secondary air system monitoring	AIR_ENA: YES or NO		
	A/C system refrigerant monitoring	ACRF_ENA: YES or NO		
	Oxygen sensor monitoring	O2S_ENA: YES or NO		

PARAMETER IDENTIFICATION (PID)	DESCRIPTION	COMMON EXAMPLE OF GENERAL SCAN TOOL DISPLAY	INSPECTION CONDITION	NORMAL CONDITION
41	Oxygen sensor heater monitoring	HTR_ENA: YES or NO		
	EGR system monitoring	EGR_ENA: YES or NO		
	Completion status of non-continuous monitors this monitoring cycle:	Completion status of non-continuous monitors this monitoring cycle:		
	Catalyst monitoring	CAT_CMPL: YES or NO		
	Evaporative system monitoring	EVAP_CMPL: YES or NO		
	Oxygen sensor monitoring	O2S_CMPL: YES or NO		
	Oxygen sensor heater monitoring	HTR_CMPL: YES or NO		
	EGR system monitoring	EGR_CMPL: YES or NO		
42	Control module voltage	VPWR: xx.xxx V	See M.U.T.-III item No.1.	
43	Absolute Load Value	LOAD_ABS: xxx.x%	See M.U.T.-III item No.72.	
44	Commanded Equivalence Ratio	EQ_RAT: x.xxx	Engine: running • "1" means "stoichiometric air fuel ratio". The smaller air fuel ratio, the rich return. The more air fuel ratio, the lean return.	0 –1.999 (Display range)
45	Relative Throttle Position	TP_R: xxx.x%	See M.U.T.-III item No. BC.	
46	Ambient air temperature	AAT: xxx° C (xxx° F)	–	
47	Absolute Throttle Position B	TP_B: xxx.x%	See M.U.T.-III item No. BD.	
49	Accelerator Pedal Position D	APP_D: xxx.x%	See M.U.T.-III item No. BE.	
4A	Accelerator Pedal Position E	APP_E: xxx.x%	See M.U.T.-III item No. BF.	
4C	Commanded Throttle Actuator Control	TAC_PCT: xxx.x%	See M.U.T.-III item No.58.	

ACTUATOR TEST REFERENCE TABLE

M1131152501841

*NOTE: *: Continues for 27 minutes. Can be released by pressing the CLEAR key.*

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT		NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
A/C relay	16	A/C compressor clutch relay	A/C compressor clutch relay turns from OFF to ON.	Ignition switch: "ON"		Clicks when A/C compressor clutch is driven.	Procedure No. 26	P.13A-871
Cooling fan	14	Radiator fan, A/C condenser fan	Drive the fan motor	Ignition switch: "ON"		Radiator fan and A/C condenser fan rotate.	–	–
EVAP. emission purge SOL. Valve	10	Evaporative emission purge solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0443	P.13A-500
EVAP. emission ventilation SOL. Valve	15	Evaporative emission ventilation solenoid	Solenoid valve turns from OFF to ON.	Ignition switch: "ON"		Clicks when solenoid valve is driven.	Code No. P0446	P.13A-507
Fuel pump	09	Fuel pump	Fuel pump operate and fuel is recirculated	Ignition switch: "ON"	Listen near the fuel tank for the sound of fuel pump operation	Sound of operation is heard	Procedure No. 22	P.13A-848

M.U.T.-III SCAN TOOL DISPLAY	ITEM NO.	INSPECTION ITEM	DRIVE CONTENTS	INSPECTION REQUIREMENT	NORMAL CONDITION	INSPECTION PROCEDURE NO.	REFERENCE PAGE
Ignition timing 5 BTDC	11*	Basic ignition timing	Set to ignition timing adjustment mode	• Engine: idling • Connect timing light	5° BTDC	–	–
Injector	1	Injectors	Specified injector is stopped	Engine: warm up, idle (cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idle condition is changed by stopping selected cylinder: this can cause an unstable condition and the engine may stall.	Code No. P0201, Code No. P0202, Code No. P0203, Code No. P0204	P.13A-367, P.13A-377, P.13A-387, P.13A-397
Oil control valve	17	Intake engine oil control valve, exhaust engine oil control valve	Switch the intake engine oil control valve and exhaust engine control valve from OFF to ON	Ignition switch: ON	When the valve is actuated, operating noise is audible.	Code No. P1021, P1025	P.13A-646, P.13A-653

CHECK AT THE ENGINE CONTROL MODULE (ECM)

M1131153501048

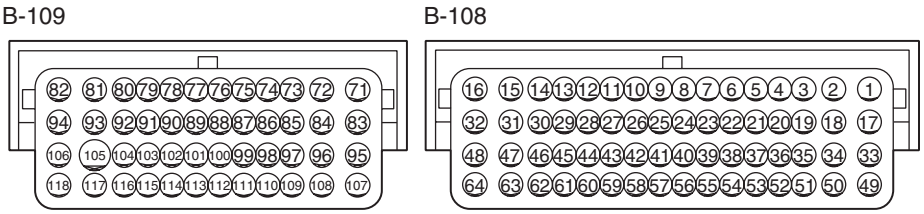
1. Disconnect the ECM connectors B-108 and B-109, and connect check harness special tool MB992110 between the ECM connectors.
2. Measure the voltage between each check harness connector terminal and check harness connector ground terminal (No. 81 or No. 93).

TERMINAL VOLTAGE CHECK CHART

*NOTE: *1: The average voltage through an analog voltmeter is described in this service manual (because the average voltage would be not constantly shown on a digital voltmeter).*

*NOTE: *2: Vehicles for Canada, the headlight, taillight, etc. remain lit even when the lighting switch is in "OFF" position but is no problem for checks.*

Check harness special tool MB992110 connector terminal arrangement



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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)	NORMAL CONDITION
1	Intake engine oil control valve	Engine: Warming up, idling	B+
		Engine: Warming up, under the high load operation.	4 –10 V*1
2	No. 1 injector	Engine: While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 9 –15 V*1, it is slightly reduced temporarily.
3	No. 2 injector		
18	No. 3 injector		
19	No. 4 injector		
4	Ignition coil No. 1 (ignition power transistor	Engine: 3,000 r/min	0.3 –3.0 V*1
5	Ignition coil No. 2 (ignition power transistor		
20	Ignition coil No. 3 (ignition power transistor		
21	Ignition coil No. 4 (ignition power transistor		
6	Starter active signal <CVT>	Engine: cranking	B+
		Engine: idling	1 V or less
7	Exhaust camshaft position sensor	Engine: cranking	2.0 –4.8 V*1
		Engine: idling	2.0 –3.0 V*1
8	Crankshaft position sensor	Engine: cranking	0.4 –4.0 V*1
		Engine: idling	2.0 –3.0 V*1
9	Sensor supplied voltage	Ignition switch: "ON"	4.9 –5.1 V

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
10	Throttle position sensor (main)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	0.3 –0.7 V
			Fully open the throttle valve with your finger	4.0 V or more
11	Throttle position sensor (sub)	• Remove the intake air hose at the throttle body • Disconnect the throttle position sensor connector, and then connect terminal numbers No. 3, No. 4, No. 5 and No. 6 with the use of the special tool: MB991658. • Ignition switch: "ON"	Fully close the throttle valve with your finger	4 V or more
			Fully open the throttle valve with your finger	1 V or less
12	Power supply voltage applied to throttle position sensor	Ignition switch: "ON"		4.9 –5.1 V
14	Intake camshaft position sensor	Engine: cranking		2.0 –4.8 V
		Engine: idling		2.0 –3.0 V
15	Throttle actuator control motor (+)	Ignition switch: "ON" Accelerator pedal: fully opened →fully closed		Decreases slightly (Approximately 2 V) from battery voltage.
16	Throttle actuator control motor (–)	Ignition switch: "ON" Accelerator pedal: fully closed →fully opened		Decreases slightly (Approximately 2 V) from battery voltage.

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
17	Exhaust engine oil control valve	Engine: warming up, idling		B+
		Engine: Warming up, under the high load operation.		4.0 –10 V*1
26	Engine coolant temperature sensor	Ignition switch: "ON"	When engine coolant temperature is –20° C (–4° F)	3.9 –4.5 V
			When engine coolant temperature is 0° C (32° F)	3.2 –3.8 V
			When engine coolant temperature is 20° C (68° F)	2.3 –2.9 V
			When engine coolant temperature is 40° C (104° F)	1.3 –1.9 V
			When engine coolant temperature is 60° C (140° F)	0.7 –1.3 V
			When engine coolant temperature is 80° C (176° F)	0.3 –0.9 V
31	EGR valve [stepper motor coil (A)] <California>	Ignition switch: "LOCK" (OFF) →"ON"		5 –8 V*1 (changes about three seconds repeatedly)
32	EGR valve [stepper motor coil (B)] <California>			
47	EGR valve [stepper motor coil (C)] <California>			
48	EGR valve [stepper motor coil (D)] <California>			
33	Heated oxygen sensor (3rd) heater	Engine: warming up, idling (20 seconds after starting engine)		1 V or less
		Engine: revving		B+
34	Heated oxygen sensor (front) heater	Engine: warming up, idling (20 seconds after starting engine)		9 –11 V*1
		Engine: revving		9 –11 V*1 →B+ (momentarily)
35	Heated oxygen sensor (rear) heater	Engine warming up, idling (20 seconds after starting engine)		9 –11 V*1
		Engine: revving		9 –11 V*1 →B+ (momentarily)
36	Engine oil pressure switch	Ignition switch: "ON"		0 –0.1 V
		Engine: idling		B+
37	Evaporative emission purge solenoid	Ignition switch: "ON"		B+
		Engine: warming up, 3,000 r/min (with 3 minutes after the engine starting sequence is completed)		Voltage drops

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TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
38	Heated oxygen sensor (front)	Engine: warming up, 2,500 r/min		0.5 ⇔ 1.4 V (changes repeatedly)
39	Heated oxygen sensor (front) offset voltage	Ignition switch: "ON"		0.4 –0.6 V
40	Heated oxygen sensor (rear)	• Transaxlle: 2nd (5 positions CVT: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more		1.0 –1.5 V
41	Heated oxygen sensor (rear) offset voltage	Ignition switch: "ON"		0.4 –0.6 V
44	Power supply voltage applied to manifold absolute pressure sensor	Ignition switch: "ON"		4.9 –5.1 V
45	Manifold absolute pressure sensor	Ignition switch: "ON"	At altitude of 0 m (0 ft.)	3.8 –4.2 V
			At altitude of 600 m (1,969 ft.)	3.5 –3.9 V
			At altitude of 1,200 m (3,937 ft.)	3.3 –3.7 V
			At altitude of 1,800 m (5,906 ft.)	3.0 –3.4 V
		Engine: warming up, idling		0.6 –1.4 V
		When engine is suddenly revved		Voltage varies
54	Heated oxygen sensor (3rd)	• Transaxle: 2nd (5 positions CVT: "L" range) • Drive with wide open throttle • Engine: 3,500 r/min or more		1.0 –1.5 V
55	Heated oxygen sensor (3rd) offset voltage	Ignition switch: "ON"		0.4 –0.6 V
58	Power steering pressure switch	Engine: warming up, idling	When steering wheel is not turned	B+
			When steering wheel is turned	1 V or less
60	Generator G terminal	• Engine: warming up, idling • Radiator fan: stopped • Headlight: OFF to ON*2 • Stop light: OFF to ON • Rear defogger switch: OFF to ON		Voltage increases
61	Generator FR terminal	• Engine: warming up, idling • Radiator fan: stopped • Headlight: OFF to ON*2 • Stop light: OFF to ON • Rear defogger switch: OFF to ON		Voltage drops

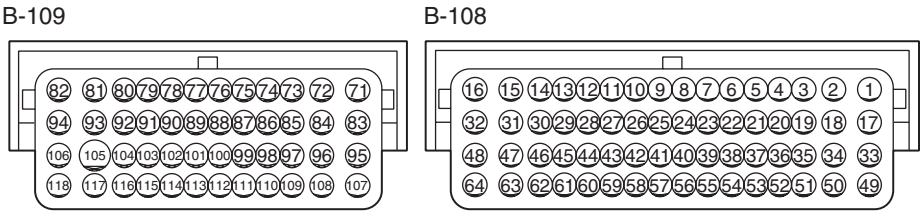
TSB Revision

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
62	Generator L terminal	Ignition switch: "ON"		0.5 –2.0 V
		Engine: idling		B+
72	Power supply voltage applied to throttle actuator control motor	Ignition switch: "ON"		B+
73	MFI relay (power supply)	Ignition switch: "LOCK" (OFF)		B+
		Ignition switch: "ON"		1 V or less
74	Accelerator pedal position sensor (main)	Ignition switch: "ON"	Release the accelerator pedal	0.9 –1.1 V
			Depress the accelerator pedal fully	4 V or more
75	Power supply voltage applied to accelerator pedal position sensor (main)	Ignition switch: "ON"		4.9 –5.1 V
77	Accelerator pedal position sensor (sub)	Ignition switch: "ON"	Release the accelerator pedal	0.4 –0.6 V
			Depress the accelerator pedal fully	2 V or more
78	Power supply voltage applied to accelerator pedal position sensor (sub)	Ignition switch: "ON"		4.9 –5.1 V
82	Power supply	Ignition switch: "ON"		B+
84	Throttle actuator control motor relay	Ignition switch: "ON" →"LOCK" (OFF)		1 V or less →B+ → 1 V or less
85	Clutch pedal position switch	Ignition switch: "ON"	Release the clutch pedal	10 V or more
			Depress the clutch pedal fully	1 V or less
87	Air flow sensor	Engine is revved		Voltage increases in response to revving

TERMINAL NO.	INSPECTION ITEM	INSPECTION CONDITION (ENGINE CONDITION)		NORMAL CONDITION
89	Intake air temperature sensor	Ignition switch: "ON"	When intake air temperature is −20° C (−4° F)	3.8 –4.4 V
			When intake air temperature is 0° C (32° F)	3.2 –3.8 V
			When intake air temperature is 20° C (68° F)	2.3 –2.9 V
			When intake air temperature is 40° C (104° F)	1.5 –2.1 V
			When intake air temperature is 60° C (140° F)	0.8 –1.4 V
			When intake air temperature is 80° C (176° F)	0.4 –1.0 V
92	Ignition switch-IG	Ignition switch: "ON"		B+
96	Fuel pump relay	Ignition switch: "ON"		B+
		Engine: idling		1.0 V or less
102	A/C compressor clutch relay	• Engine: idling • A/C switch: OFF →ON (A/C compressor is operating)		B+ →1 V or less as A/C clutch cycles
104	Backup power supply	Ignition switch: "LOCK" (OFF)		B+
105	Ignition switch-ST	Ignition switch: cranking		8 V or more
106	Starter relay	Engine: cranking		B+
		Engine: idling		1 V or less
109	Vehicle speed sensor <M/T>	• Ignition switch: "ON" • Move the vehicle slowly forward		0 –1 ⇔ 4 –5 V (changes repeatedly)
112	Fuel tank differential pressure sensor	• Ignition switch: "ON" • Fuel cap removal		1.5 –3.5 V
114	Power supply voltage applied to fuel tank differential pressure sensor	Ignition switch: "ON"		4.9 –5.1 V
115	Fuel tank temperature sensor	Ignition switch: "ON"	When fuel tank temperature is 0° C (32° F)	2.7 –3.1 V
			When fuel tank temperature is 20° C (68° F)	2.1 –2.5 V
			When fuel tank temperature is 40° C (104° F)	1.6 –2.0 V
			When fuel tank temperature is 80° C (176° F)	0.8 –1.2 V
117	Evaporative emission ventilation solenoid	Ignition switch: "ON"		B+
		Carry out the actuator test to drive the solenoid valve.		1 V or less (Approximately 6 seconds)

TERMINAL RESISTANCE AND CONTINUITY CHECK

Engine-ECU harness side connector



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TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
1 –82	Intake engine oil control valve	6.9 –7.9 Ω [at 20° C (68° F)]
15 –16	Throttle actuator control motor	0.3 –80 Ω [at 20° C (68° F)]
17 –82	Exhaust engine oil control valve	6.9 –7.9 Ω [at 20° C (68° F)]
26 –27	Engine coolant temperature sensor	14 –17 kΩ [when engine coolant temperature is -20° C (-4° F)]
		5.1 –6.5 kΩ [when engine coolant temperature is 0° C (32° F)]
		2.1 –2.7 kΩ [when engine coolant temperature is 20° C (68° F)]
		0.9 –1.3 kΩ [when engine coolant temperature is 40° C (104° F)]
		0.48 –0.68 kΩ [when engine coolant temperature is 60° C (140° F)]
		0.26 –0.36 kΩ [when engine coolant temperature is 80° C (176° F)]
31 –82	EGR valve [Stepper motor coil (A)] <California>	20 –24 Ω [at 20° C (68° F)]
32 –82	EGR valve [Stepper motor coil (B)] <California>	
47 –82	EGR valve [Stepper motor coil (C)] <California>	
48 –82	EGR valve [Stepper motor coil (D)] <California>	
33 –82	Heated oxygen sensor (3rd) heater	11 –18 Ω [at 20° C (68° F)]
34 –82	Heated oxygen sensor (front) heater	4.5 –8.0 Ω [at 20° C (68° F)]
35 –82	Heated oxygen sensor (rear) heater	4.5 –8.0 Ω [at 20° C (68° F)]
37 –82	Evaporative emission purge solenoid	22 –26 Ω [at 20° C (68° F)]

TERMINAL NO.	INSPECTION ITEM	NORMAL CONDITION (INSPECTION CONDITION)
71 –Body ground	ECM ground	Continuity (2 Ω or less)
81 –Body ground		
83 –Body ground		
93 –Body ground		
82 –117	Evaporative emission ventilation solenoid	17 –21 Ω [at 20° C (68° F)]
88 –89	Intake air temperature sensor	13 –17 kΩ [when intake air temperature is –20° C (–4° F)]
		5.4 –6.6 kΩ [when intake air temperature is 0° C (32° F)]
		2.3 –3.0 kΩ [when intake air temperature is 20° C (68° F)]
		1.0 –1.65 kΩ [when intake air temperature is 40° C (104° F)]
		0.56 –0.76 kΩ [when intake air temperature is 60° C (140° F)]
		0.31 –0.43 kΩ [when intake air temperature is 80° C (176° F)]

INSPECTION PROCEDURE USING AN OSCILLOSCOPE

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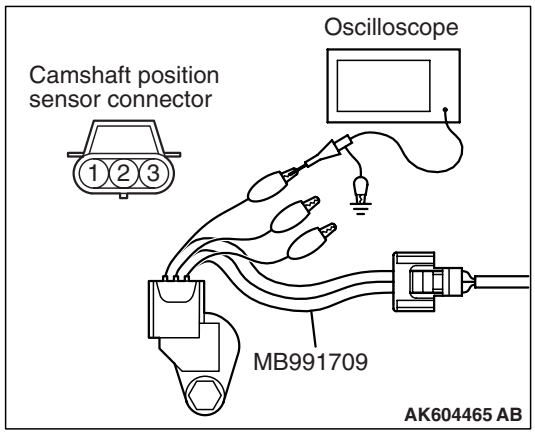
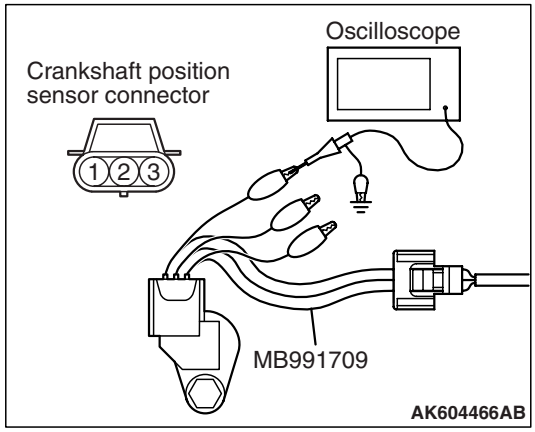
INTAKE CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR





Required Special Tools:

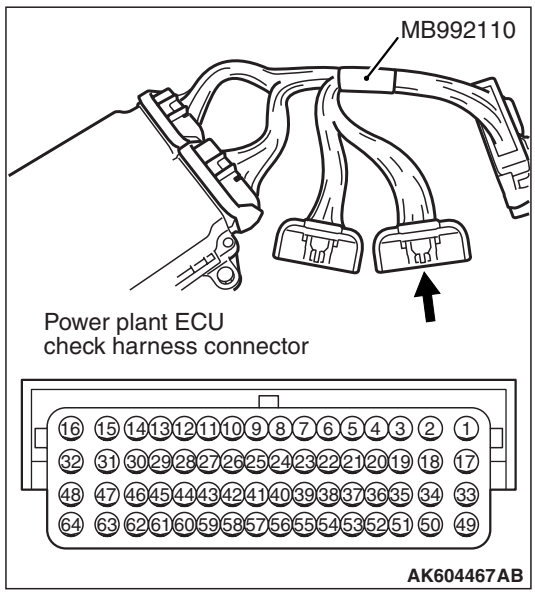
- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

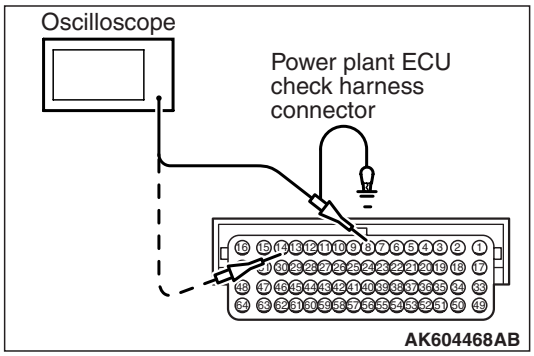
Measurement Method

1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to camshaft position sensor connector terminal No. 3.
3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 3.

Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.



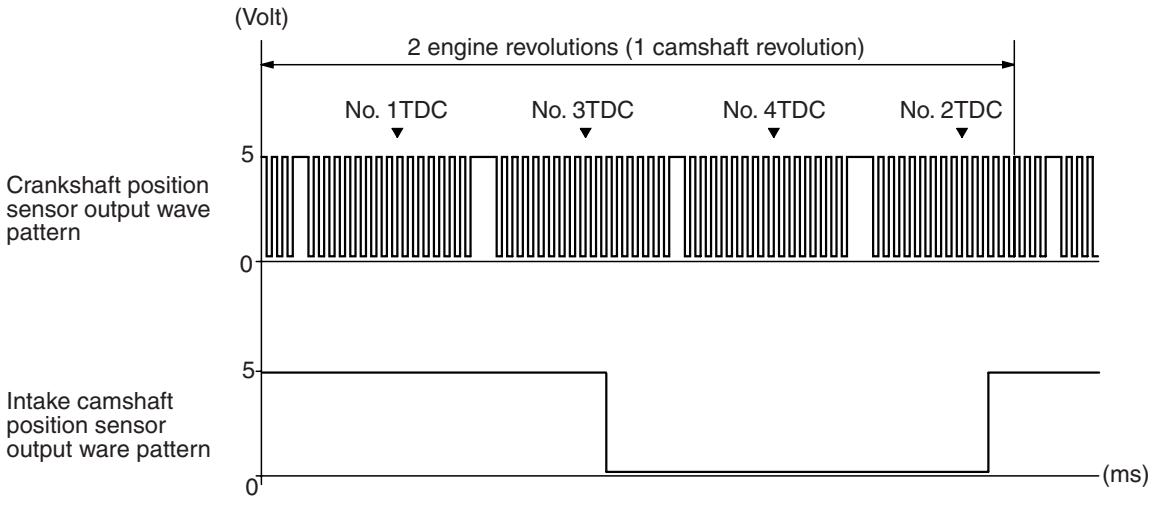


2. Connect the oscilloscope to check harness terminal No. 14. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 8. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

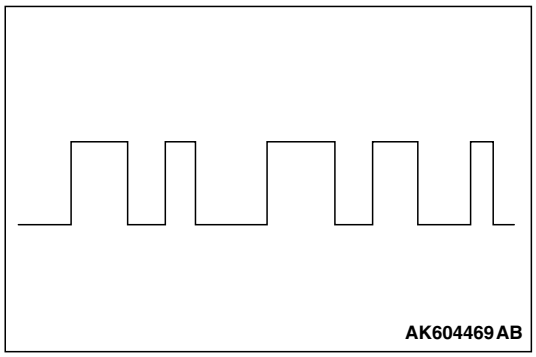
Standard wave pattern



Wave Pattern Observation Points

1. Check that cycle time becomes shorter when the engine speed increased.

Examples of Abnormal Wave Patterns



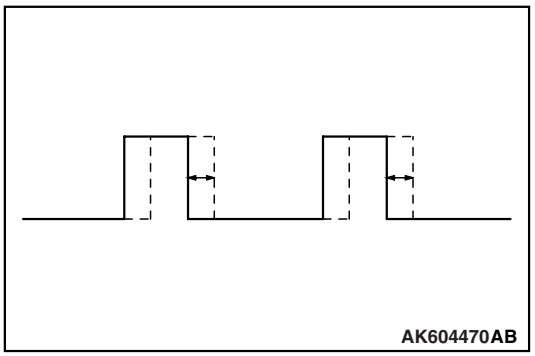
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.



Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

Wave pattern characteristics

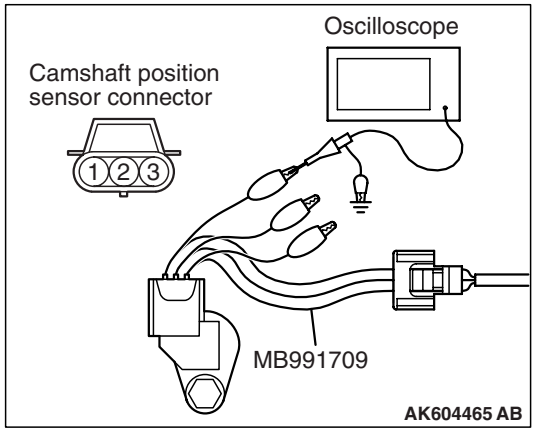
- Wave pattern is displaced to the left or right.

EXHAUST CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR

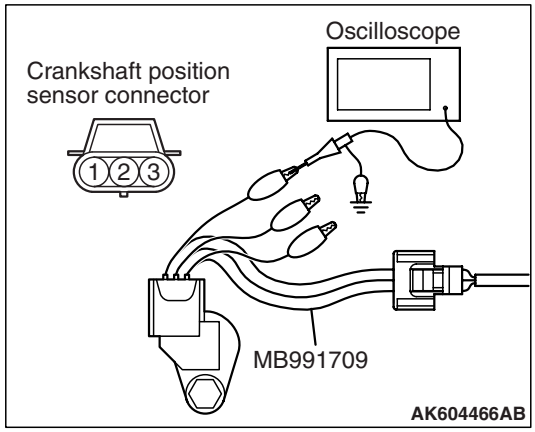
Required Special Tools:

- MB991709: Test Harness
- MB992110: Power Plant ECU Check Harness

Measurement Method



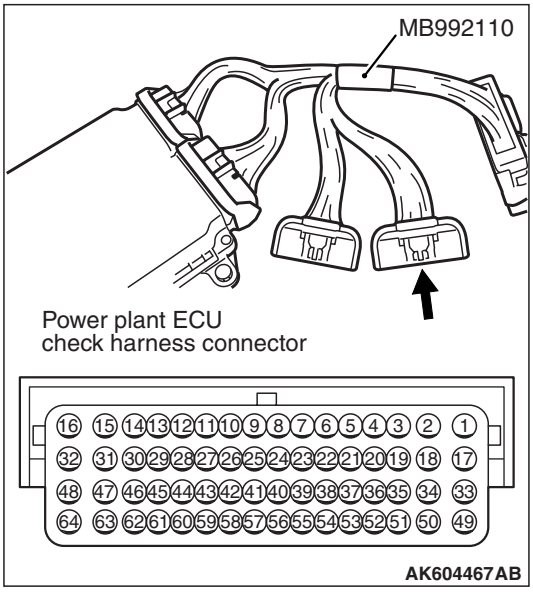
1. Disconnect the camshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to camshaft position sensor connector terminal No. 3.

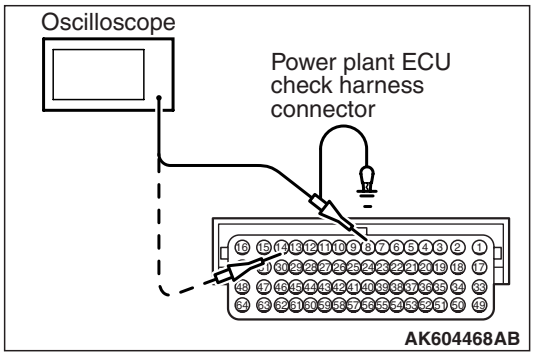


3. Disconnect the crankshaft position sensor connector, and connect the test harness special tool (MB991709) between the separated connector.
4. Connect the oscilloscope probe to crankshaft position sensor connector terminal No. 3.

Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.



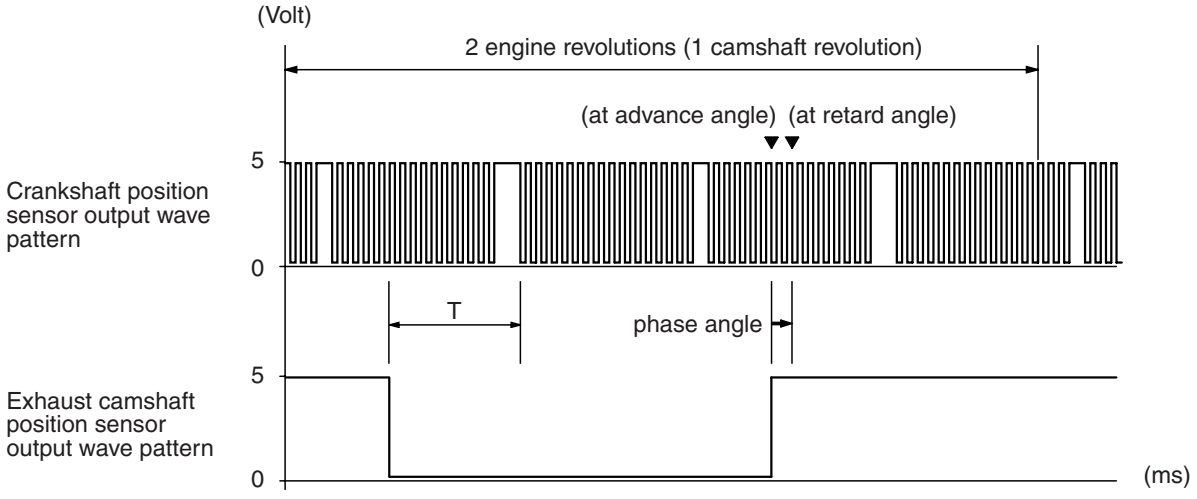


2. Connect the oscilloscope to check harness terminal No. 14. (Check the camshaft position sensor signal wave pattern.)
3. Connect the oscilloscope to check harness terminal No. 8. (Check the crankshaft position sensor signal wave pattern.)

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern

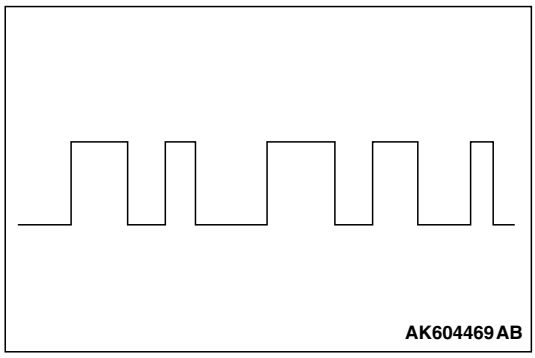


TSB Revision

Wave Pattern Observation Points

- Verify that, toward the engine speed of 2,500 r/min, time difference T from when the crankshaft position sensor output wave falls to when the exhaust camshaft position sensor output wave falls becomes less.

Examples of Abnormal Wave Patterns



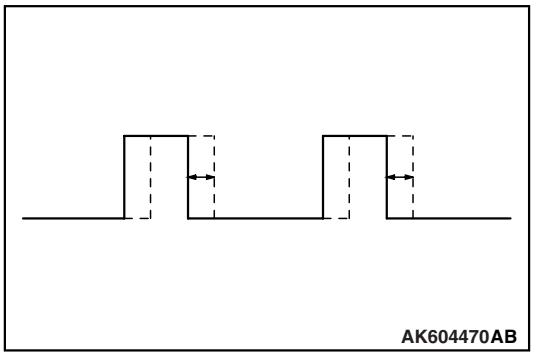
Example 1

Cause of problem

- Sensor interface malfunction.

Wave pattern characteristics

- Rectangular wave pattern is output even when the engine is not started.



Example 2

Cause of problem

- Loose timing belt.
- Abnormality in sensor disc.

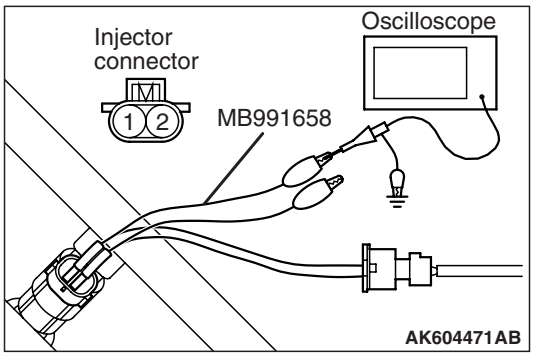
Wave pattern characteristics

- Wave pattern is displaced to the left or right.

INJECTOR

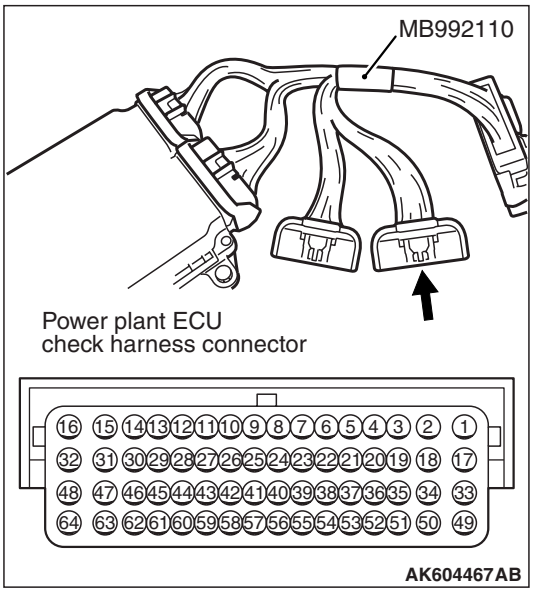
Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



Measurement Method

1. Disconnect the injector connector, and connect the test harness special tool (MB991658) between the separated connector. (All terminals should be connected.)
2. Connect the oscilloscope probe to injector connector terminal No. 2.



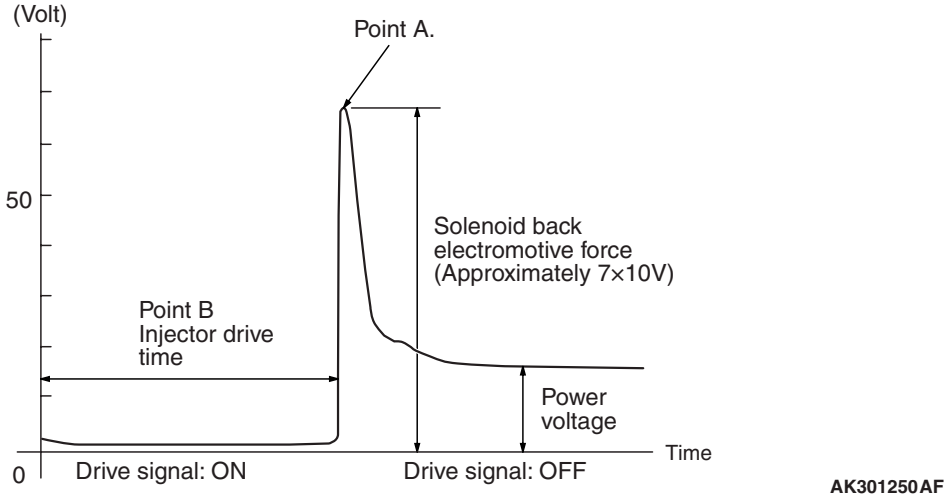
Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 2 for the number 1 cylinder.
   - Terminal No. 3 for the number 2 cylinder.
   - Terminal No. 18 for the number 3 cylinder.
   - Terminal No. 19 for the number 4 cylinder.

Standard Wave Pattern

Observation conditions	
Function	**Special pattern**
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern

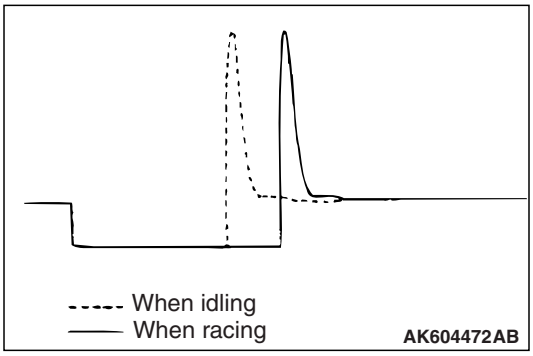


Wave Pattern Observation Points

Point A: Height of injector coil induced voltage.

CONTRAST WITH STANDARD WAVE PATTERN	PROBABLE CAUSE
Injector coil induced voltage is low or doesn't appear at all	Short in the injector solenoid

Point B: Injector drive time

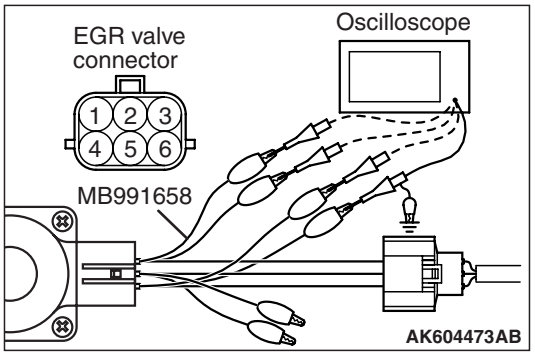


1. The injector drive time should be synchronized with the scan tool tester display.
2. When the engine is suddenly revved, the drive time will be greatly extended at first, but the drive time will soon return to original length.

EGR VALVE (STEPPER MOTOR)

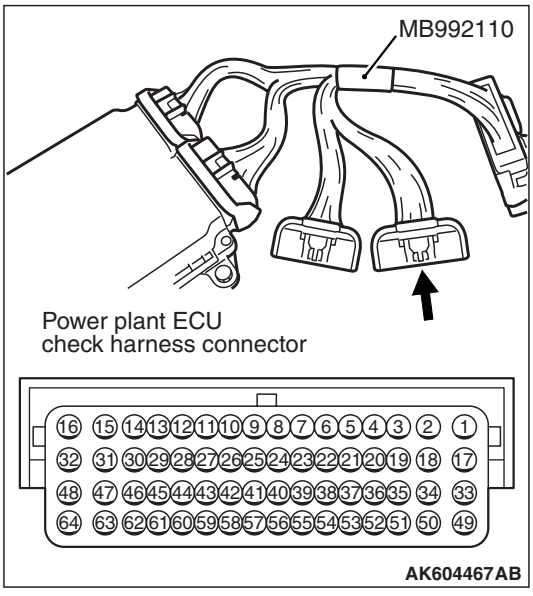
Required Special Tools:
- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness

Measurement Method

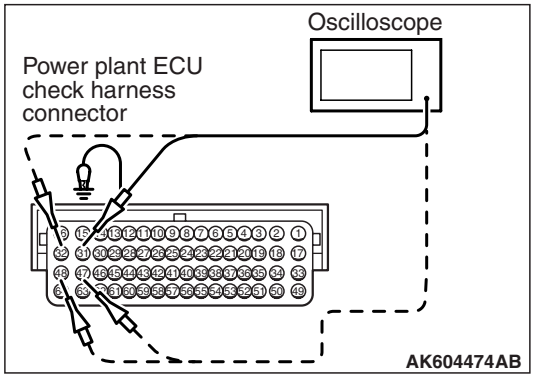


1. Disconnect the EGR valve connector, and connect the test harness special tool (MB991658) between the separated connector (All terminals should be connected).
2. Connect the oscilloscope probe to the EGR valve connector terminal No. 1, terminal No. 3, terminal No. 4, terminal No. 6 respectively.

Alternate method



1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110 between the separated connectors.

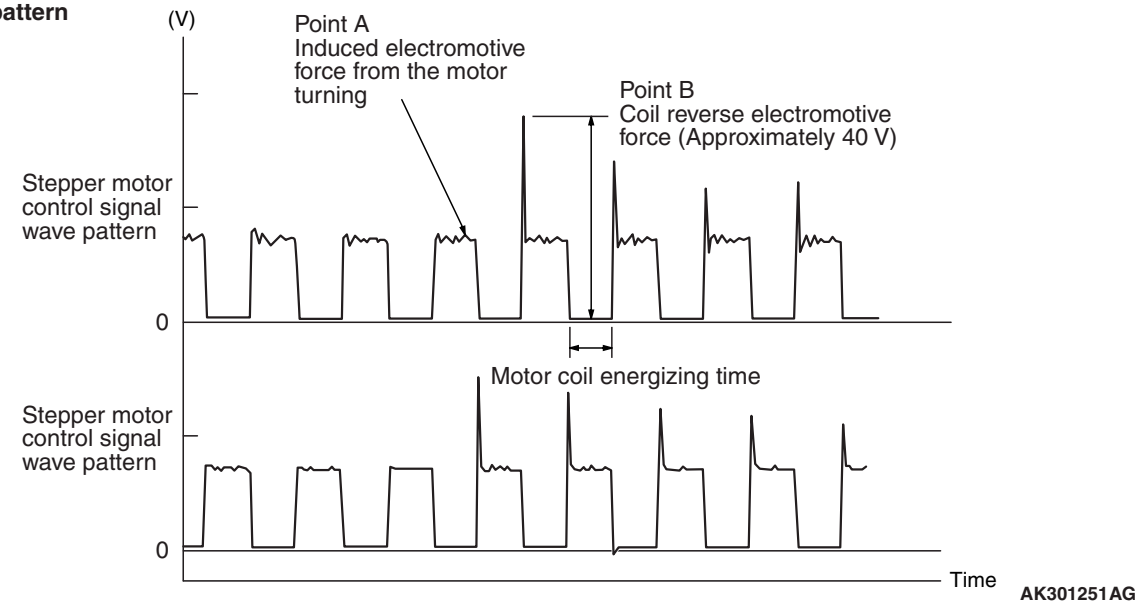


2. Connect the oscilloscope probe to check harness terminal No. 31, No. 32, No. 47 and No. 48.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	High
Pattern selector	Display
Engine condition	Revving

Standard wave pattern



Wave Pattern Observation Points

1. Check that the standard wave pattern appears when the EGR valve is operating.

Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to abnormal wave pattern.)

CONTRAST WITH STANDARD WAVE PATTERN	**PROBABLE CAUSE**
Induced electromotive force does not appear or is extremely small	Malfunction of motor

Point B: Height of coil back electromotive force

CONTRAST WITH STANDARD WAVE PATTERN	**PROBABLE CAUSE**
Coil reverse electromotive force does not appear or is extremely small	Short in the coil

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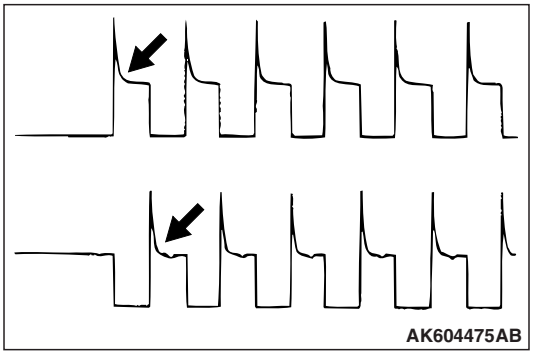
Examples of Abnormal Wave Patterns



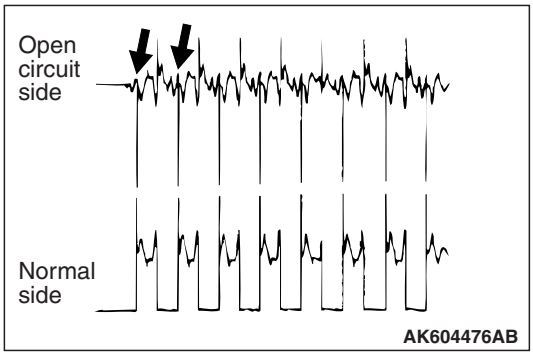
Example 1

Cause of problem

- Malfunction of motor. (Motor is not operating.)

Wave pattern characteristics

- Induced electromotive force from the motor turning does not appear.



Example 2

Cause of problem

- Open circuit in the line between the EGR valve and the ECM.

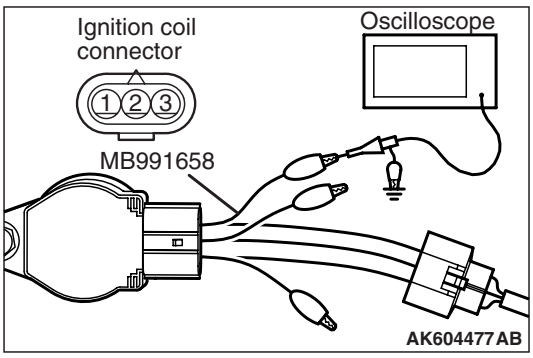
Wave pattern characteristics

- Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 volt.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.

IGNITION COIL AND IGNITION POWER TRANSISTOR

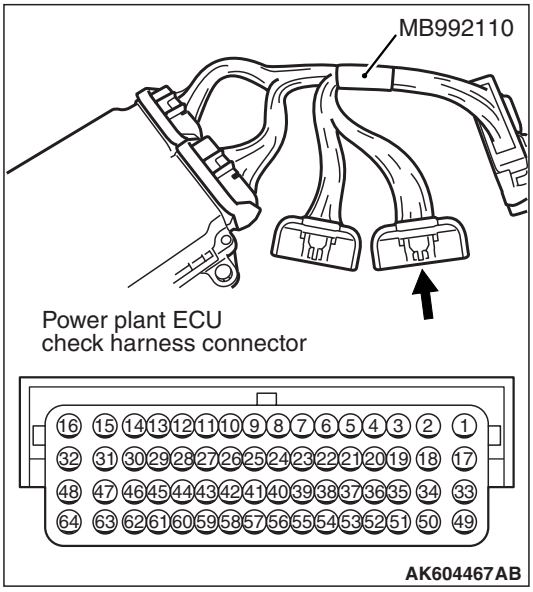
Required Special Tools:

- MB991658: Test Harness
- MB992110: Power Plant ECU Check Harness



Measurement Method

1. Disconnect the ignition coil connector, and connect test harness special tool (MB991658) between the separated connector. (All terminals should be connected.)
2. Connect the oscilloscope probe to ignition coil connector terminal No. 2.



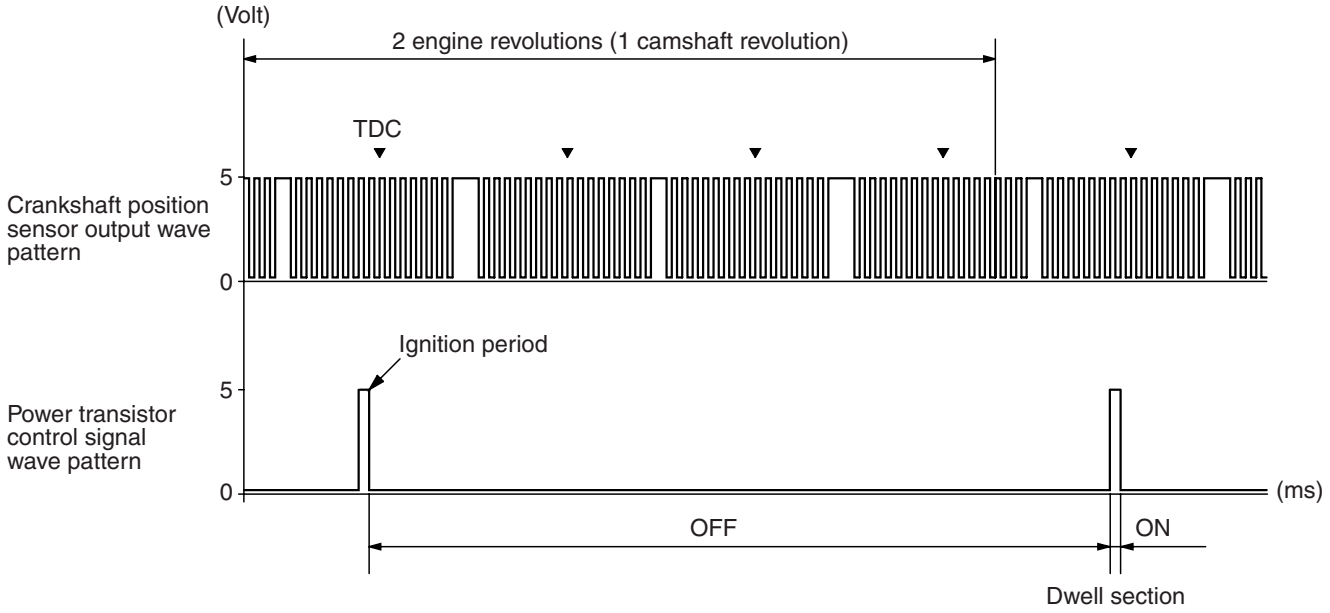
Alternate method

1. Disconnect all ECM connectors. Connect the check harness special tool (MB992110) between the separated connectors.
2. Connect the oscilloscope probe to each check harness connector terminal to analyze each cylinder:
   - Terminal No. 4 for the number 1 cylinder.
   - Terminal No. 5 for the number 2 cylinder.
   - Terminal No. 20 for the number 3 cylinder.
   - Terminal No. 21 for the number 4 cylinder.

Standard Wave Pattern

Observation condition	
Function	**Special pattern**
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

Point: The power transistor control signal (ignition timing) is advanced when the engine speed is increased.

CONDITION OF WAVE PATTERN BUILD-UP SECTION AND MAXIMUM VOLTAGE	PROBABLE CAUSE
Voltage value is too low	Open-circuit in ignition primary circuit

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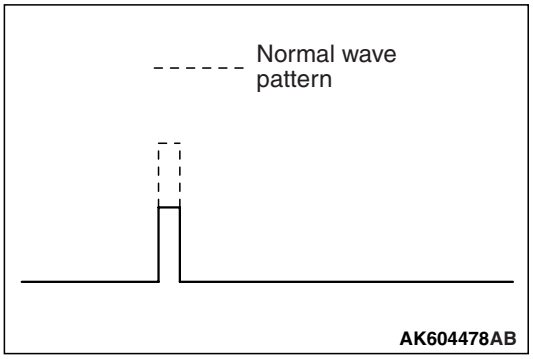


Examples of Abnormal Wave Patterns

Example 1 (Wave pattern during engine cranking)

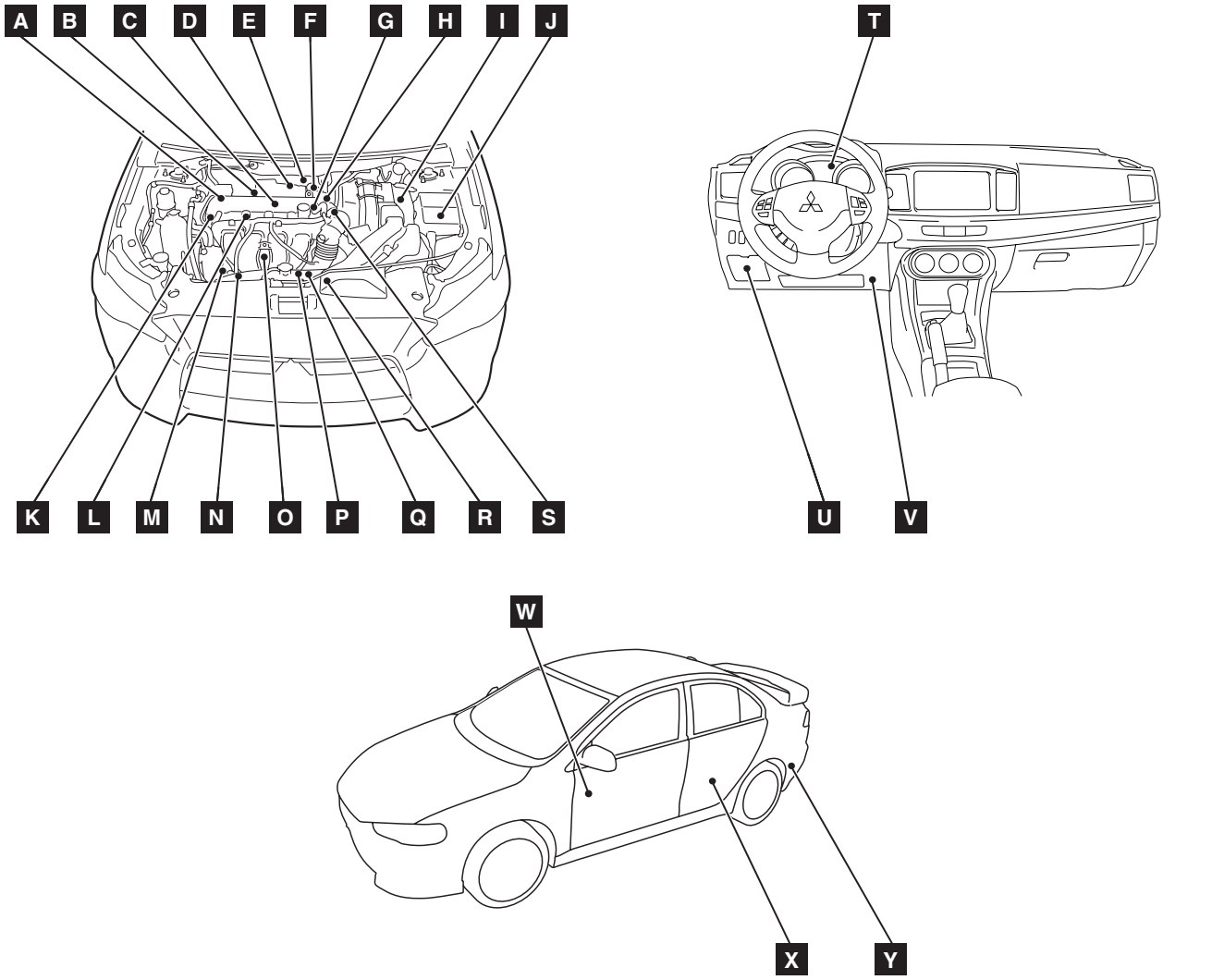
- Cause of problem
  Open-circuit in ignition primary circuit
- Wave pattern characteristics
  Voltage value is too low.

ON-VEHICLE SERVICE

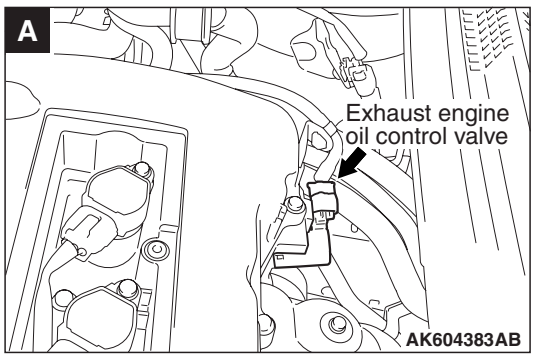
COMPONENT LOCATION

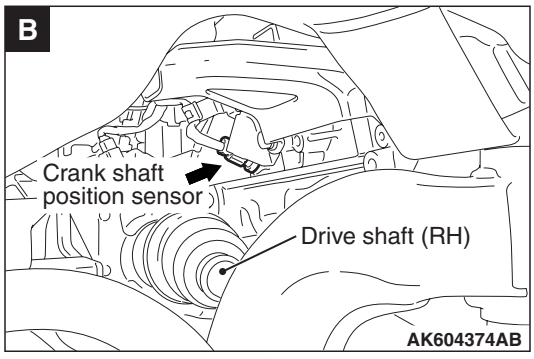
M1131002101982

NAME	SYMBOL	NAME	SYMBOL
Accelerator pedal position sensor	V	Heated oxygen sensor (rear) <California>	D
Crankshaft position sensor	B	Heated oxygen sensor (rear) <Except for California>	W
Engine control module	I	Heated oxygen sensor (3rd) <California>	W
Engine coolant temperature sensor	H	Ignition coil	C
ETACS-ECU (incorporating fuel pump relay)	U	Injector	L
Evaporative emission purge solenoid	P	Intake camshaft position sensor	G
Evaporative emission ventilation solenoid	Y	Intake engine oil control valve	K
Exhaust camshaft position sensor	F	Knock sensor	O
Exhaust engine oil control valve	A	Malfuunction Indicator Lamp (SERVICE ENGINE SOON or Check Engine Lamp)	T
Exhaust gas recirculation (EGR) valve	R	Manifold absolute pressure sensor	N
Fuel pump module (incorporating fuel level sensor and fuel tank pressure sensor)	X	Mass airflow sensor	S
Fuel tank differential pressure sensor	X	MFI relay	J
Fuel tank temperature sensor	X	Power steering oil pressure switch	M
Heated oxygen sensor (front) <California>	E	Throttle actuator control motor relay	J
Heated oxygen sensor (front) <Except for California>	D	Throttle body assembly (incorporating throttle position sensor)	Q



AK603739AB





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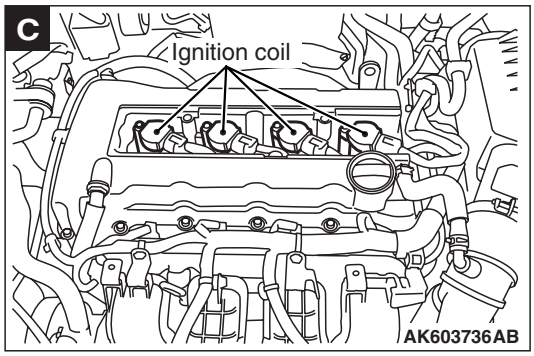
C



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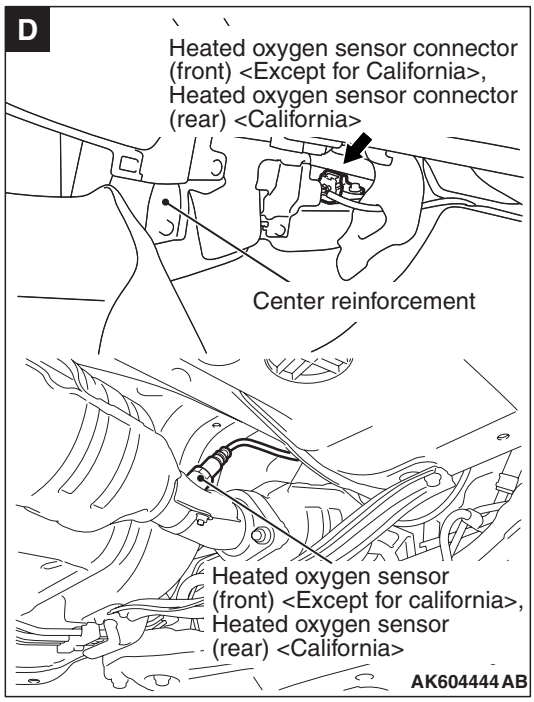

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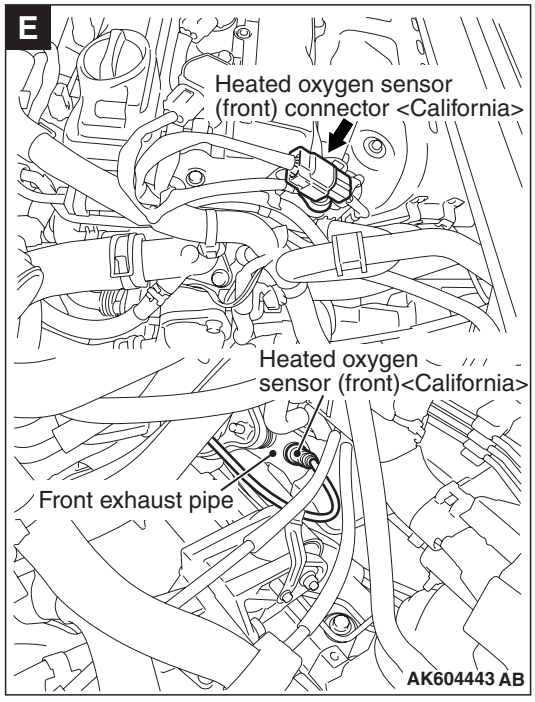

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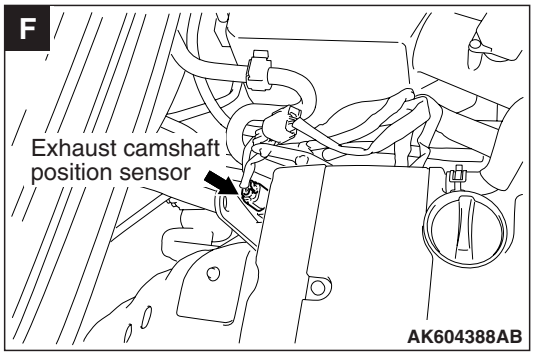
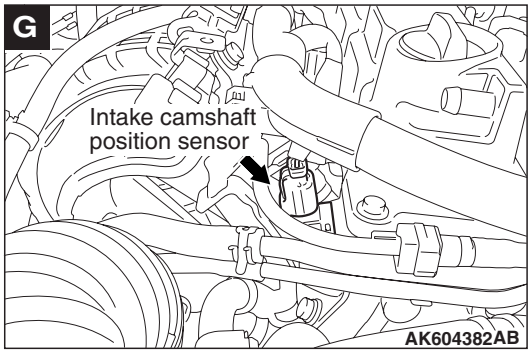
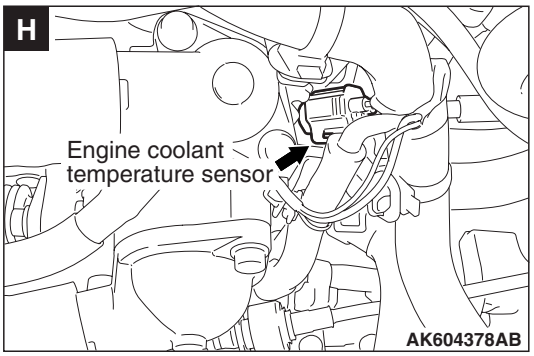
F


Exhaust camshaft
position sensor
AK604388AB

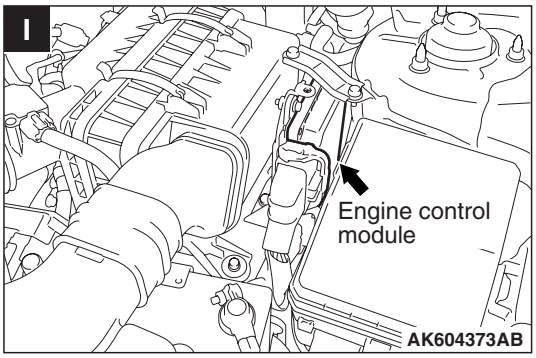
G


Intake camshaft
position sensor
AK604382AB

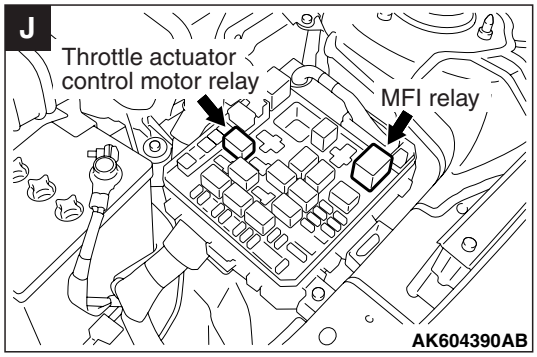
H


Engine coolant
temperature sensor
AK604378AB

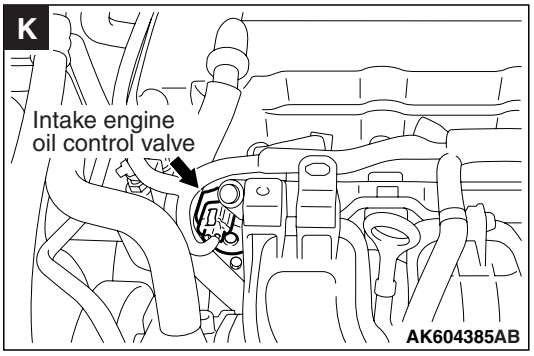
I


Engine control
module
AK604373AB

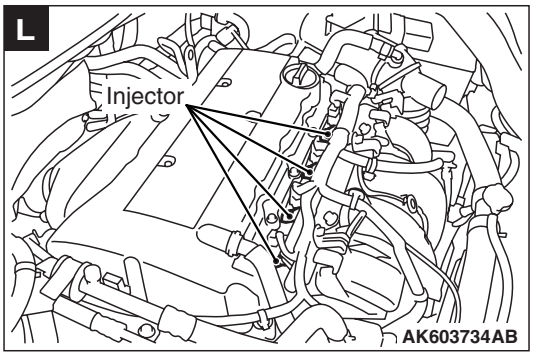
J


Throttle actuator
control motor relay
MFI relay
AK604390AB

K


Intake engine
oil control valve
AK604385AB

L


Injector
AK603734AB

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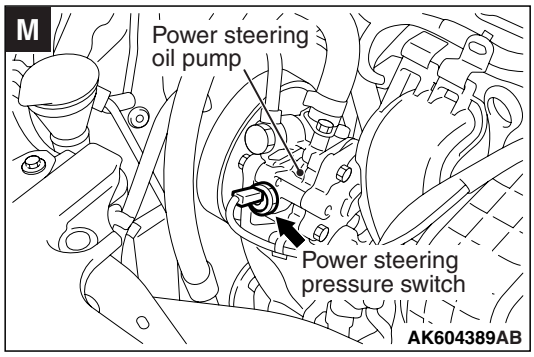

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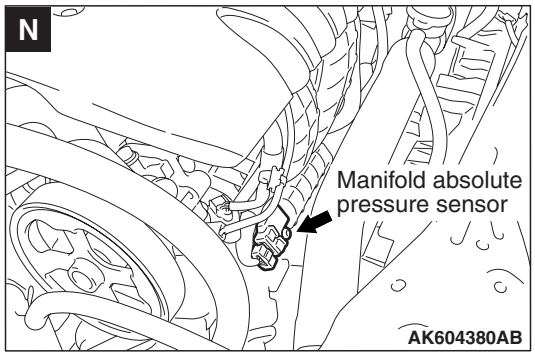

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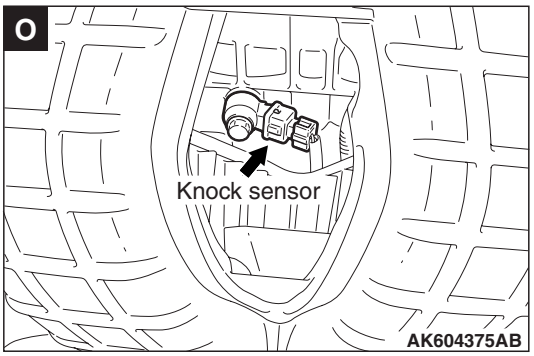

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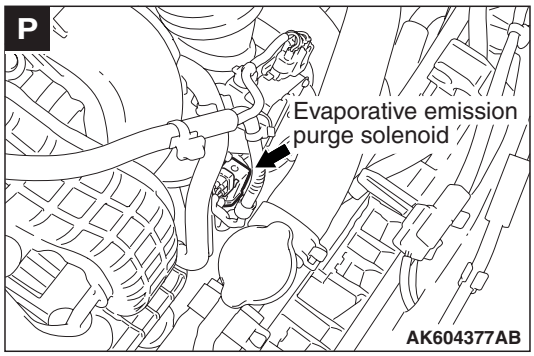

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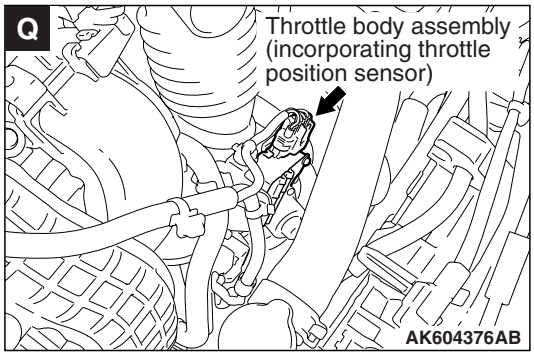

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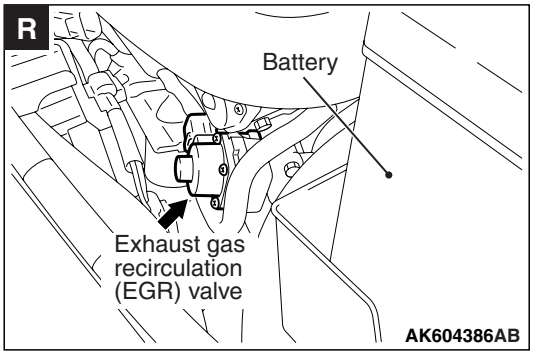

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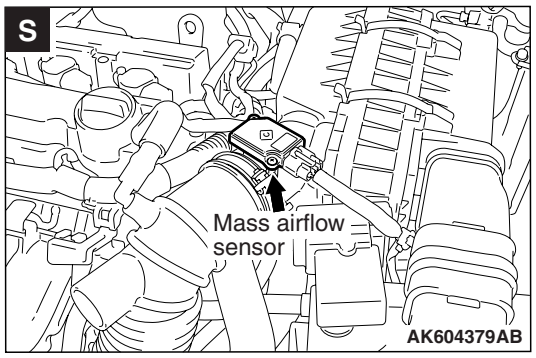

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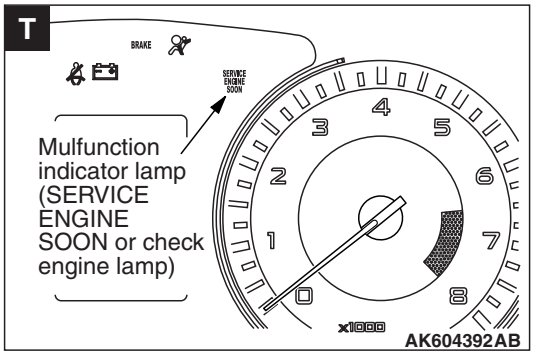

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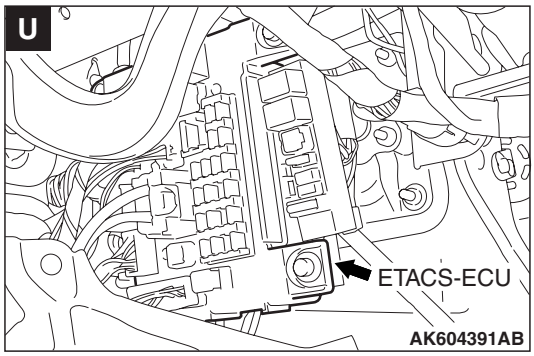
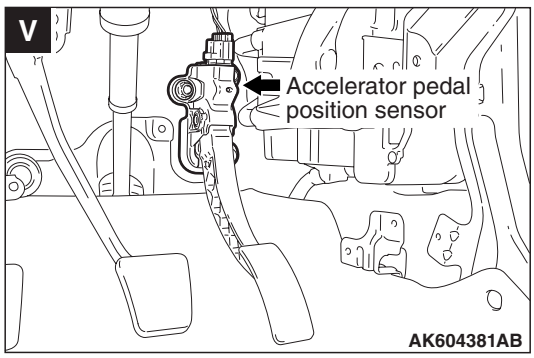
U



V



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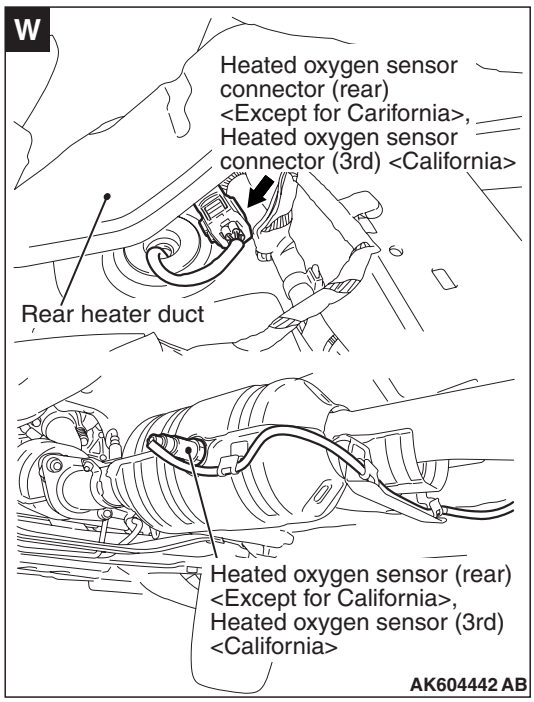

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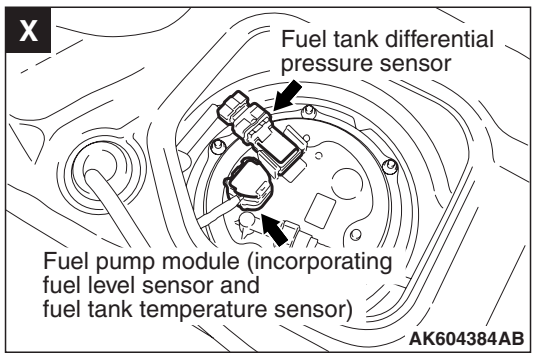

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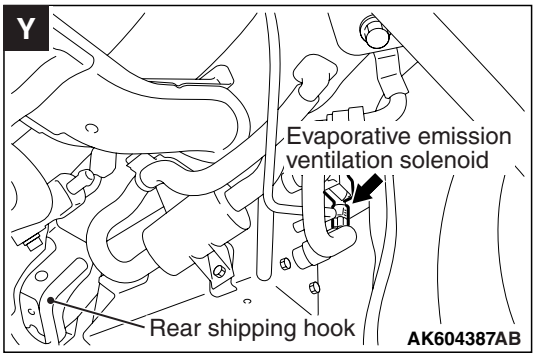


TSB Revision

THROTTLE BODY CLEANING

M1131001001249

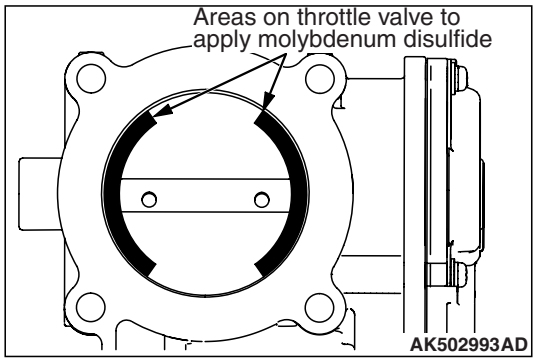
⚠ ***WARNING***

If the throttle valve is in operation, a finger might be injured as the result of being caught by the throttle valve. Make sure that the ignition switch is surely in "LOCK"(OFF) position before the service in order that the throttle valve cannot be operation.

⚠ **CAUTION**

- **When the throttle body cleaning is performed, use scan tool MB991958 to initialize the learning value (Refer to GROUP 00, Initialization Procedure for Learning Value in MFI Engine).**
- **Do not spray the cleaning solvent directly to the throttle valve.**
- **Make sure the cleaning solvent does not enter the motor and the sensor through the shaft.**
- **Do not remove molybdenum. which is applied around the throttle valve of the throttle body.**

1. Remove the throttle body.
2. Spray cleaning solvent on a clean cloth.
3. Wipe off the dirt around the throttle valve with the cloth sprayed with cleaning solvent.
4. Attach the throttle body.



FUEL PRESSURE TEST

M1131001901725

Required Special Tools:

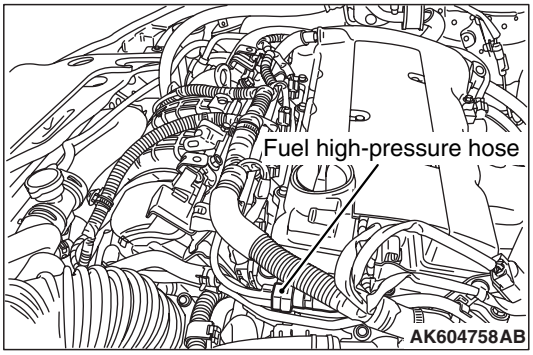
- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991981: Fuel Pressure Gauge Set
- MB992001: Hose Adaptor
- MB992049: Quick Connector
- MB992076: Injector Test Set

1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-932.)

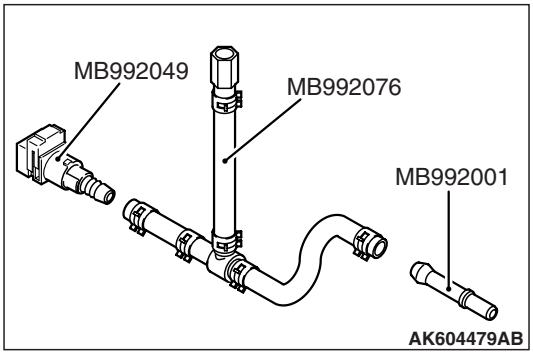
⚠ ***WARNING***

To prevent a fire, cover the hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

2. Disconnect the fuel high-pressure hose at the fuel rail side.



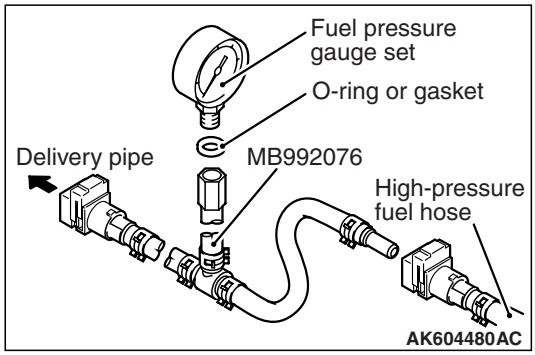
3. Assemble the special tool MB992076 (injector test set) of special tool as shown in figure.
   (1) Remove either the installation adapter for the injector or another adapter.
   (2) Install the special tool MB992049 (quick connector) and the special tool MB992001 (hose adapter) to the hose without the adapter.
   (3) Assemble the fuel pressure measurement tools as follows.



4. Assemble the fuel pressure measurement tools as follows.

<When using the fuel pressure gauge>

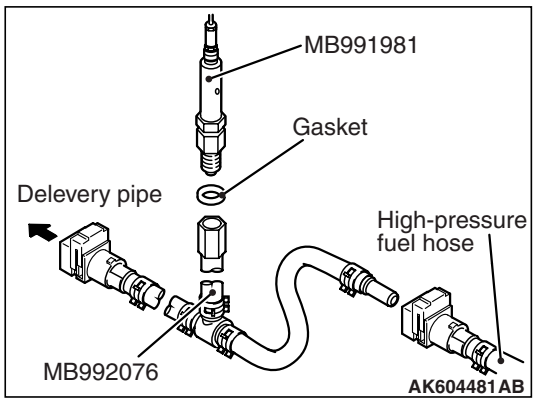
a. Via a suitable O-ring or gasket, install the fuel pressure gauge to the special tool that has already assembled as described.

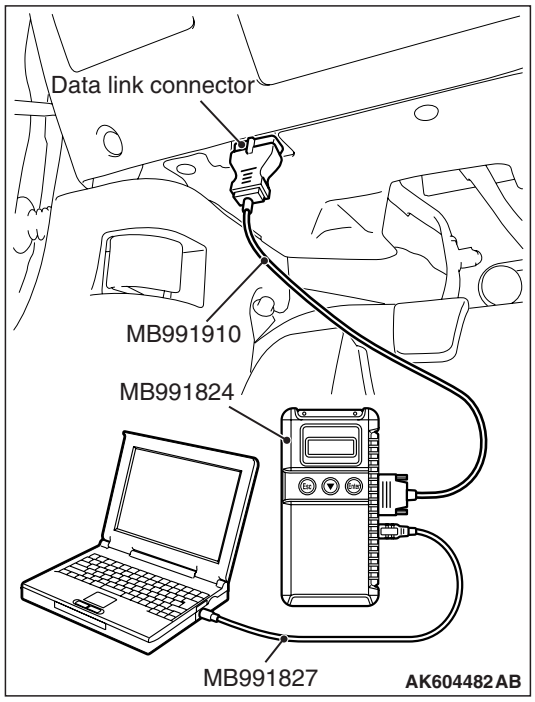


<When using special tool MB991981 (fuel pressure gauge set)>

a. Via a gasket, install the special tool MB991981 (fuel pressure gauge set) into the special tool that has already assembled as described.

5. Install the assembled fuel pressure measurement tools between the fuel rail and fuel high-pressure hose.





⚠ CAUTION

To prevent damage to scan tool MB991958, always turn the ignition switch to the "LOCK" (OFF) position before connecting or disconnecting scan tool MB991958.

6. Connect scan tool MB991958 to the data link connector.
7. Use Actuator test 09 to drive the fuel pump. Check that there is no fuel leaking from any section when the fuel pump is operating.
8. Stop the fuel pump.
9. Start the engine and run at idle.
10. Measure fuel pressure while the engine is running at idle.

    Standard value: Approximately 324 kPa (47 psi) at curb idle

11. Check to see that fuel pressure at idle does not drop even after the engine has been revved several times.
12. If any of fuel pressure measured in steps 12 to 13 is out of specification, troubleshoot and repair according to the table below.

SYMPTOM	PROBABLE CAUSE	REMEDY
• Fuel pressure too low • Fuel pressure drops after revving	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator (integrated in the fuel tank pump module)
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator (integrated in the fuel tank pump module)

13. Stop the engine and observe fuel pressure gauge reading. It is normal if the reading does not drop within two minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below. Start, then stop the engine.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator (integrated in the fuel tank pump module)
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

14. Release residual pressure from the fuel pipe line. (Refer to P.13A-932.)

TSB Revision

⚠ ***WARNING***

Cover the hose connection with shop towels to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

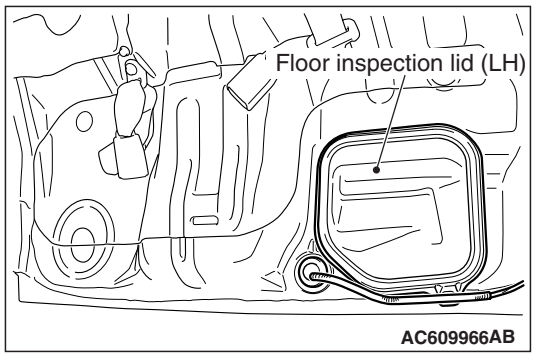
15. Remove the fuel pressure gauge and special tool from the delivery pipe.
16. Fit the fuel high-pressure hose to the delivery pipe.
17. Check for fuel leaks.
    (1) Use scan tool MB991958 to operate the fuel pump.
    (2) Check the fuel line for leaks and repair as needed.
18. Disconnect scan tool MB991958.

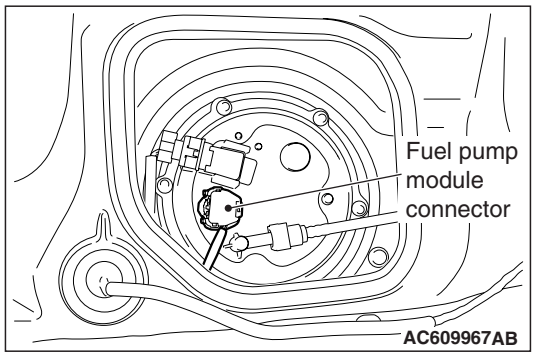
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURIZED FUEL LINES)

M1131000901487

When removing the fuel pipes and fuel hoses, follow the procedure below to release fuel pressure in the line and prevent fuel from running out, because fuel pressure in the fuel line is high.

1. Remove the rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-23) and turn up the floor carpet.
2. Remove the floor inspection lid (LH).





3. Remove the connector of fuel pump module.
4. Crank the engine for at least two seconds.
5. If the engine does not start, turn the ignition switch to the "LOCK" (OFF) position.
6. If the engine starts, turn the ignition switch to the "LOCK" (OFF) position after the engine stops.
7. Connect the fuel pump module connector.
8. Install the floor inspection lid (LH).
9. Return the floor carpet to the original condition and install the rear seat assembly (Refer to GROUP 52A –Rear Seat Assembly P.52A-23).

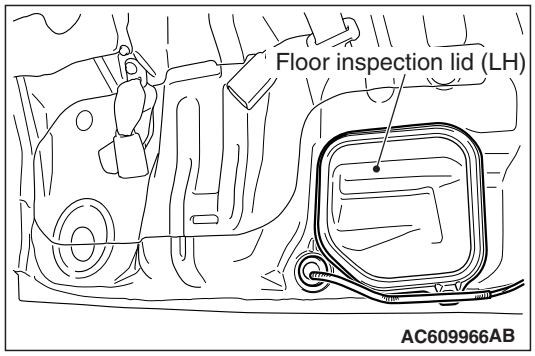
FUEL TANK PUMP OPERATION CHECK

M1131002001673

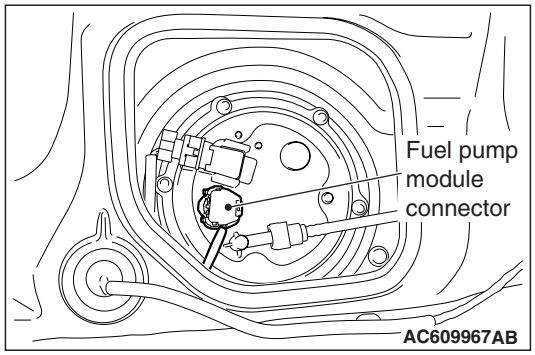
1. Remove the fuel tank cap.
2. Using scan tool, forcibly drive the fuel tank pump (integrated in the fuel pump module) to check the fuel tank pump operation.

NOTE: The operating sound of the fuel tank pump is difficult to be heard because the pump is in-tank type. Therefore, remove the fuel filler cap to check the sound from the fuel filler port.

3. If the fuel tank pump does not operate, follow the procedure below to check the pump for operation. If it is normal, check the driving circuit.
   (1) Turn the ignition switch to the "LOCK" (OFF) position.
   (2) Remove the rear seat assembly (Refer to GROUP 52A – Rear Seat Assembly P.52A-23) and turn up the floor carpet.
   (3) Remove the floor inspection lid (LH).

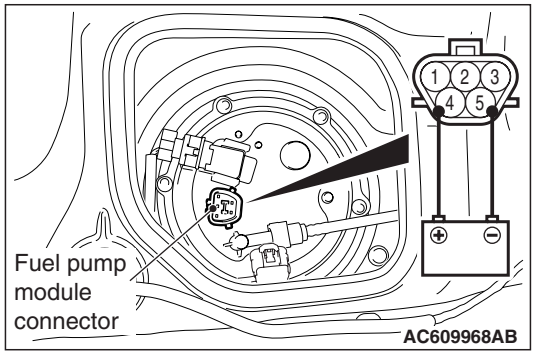


   (4) Disconnect the connector of the fuel pump module.

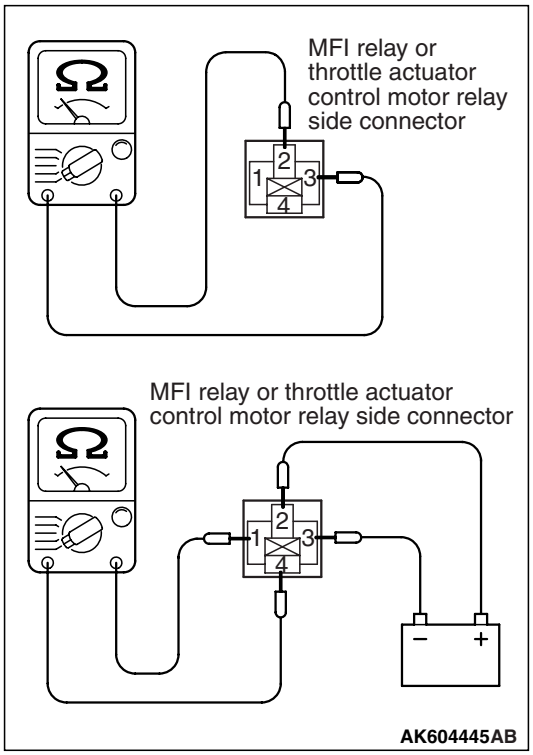


   (5) When the battery is connected to the fuel pump module connector (fuel pump module side), check that the pump operating sound can be heard. When the pump operating sound cannot be heard, replace the fuel tank pump (Refer to GROUP 13B –On-Vehicle Service, Fuel Pump Module Replacement P.13B-6).

   NOTE: The operating sound of the fuel tank pump is difficult to be heard because the pump is in-tank type. Therefore, remove the fuel filler cap to check the sound from the fuel filler port.



   (6) Install the fuel tank cap.
   (7) Connect the fuel pump module connector.
   (8) Install the floor inspection lid (LH).
   (9) Return the floor carpet to the original condition and install the rear seat assembly. (Refer to GROUP 52A –Rear Seat Assembly P.52A-23.)



MULTIPORT FUEL INJECTION (MFI) RELAY CONTINUITY CHECK

M1131050001144

Inspect the MFI relay for continuity in accordance with the chart shown below.

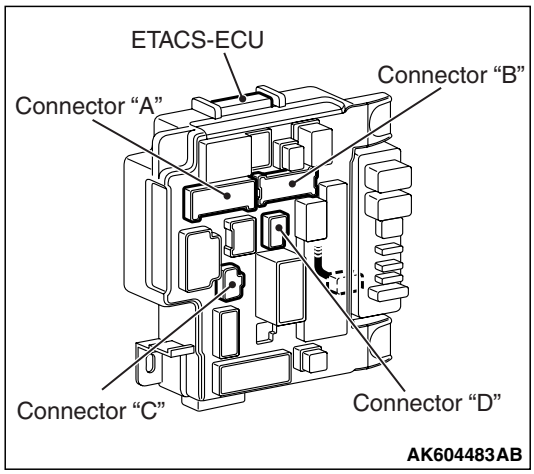
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	1 –3
Supplied	1 –3	2 –4

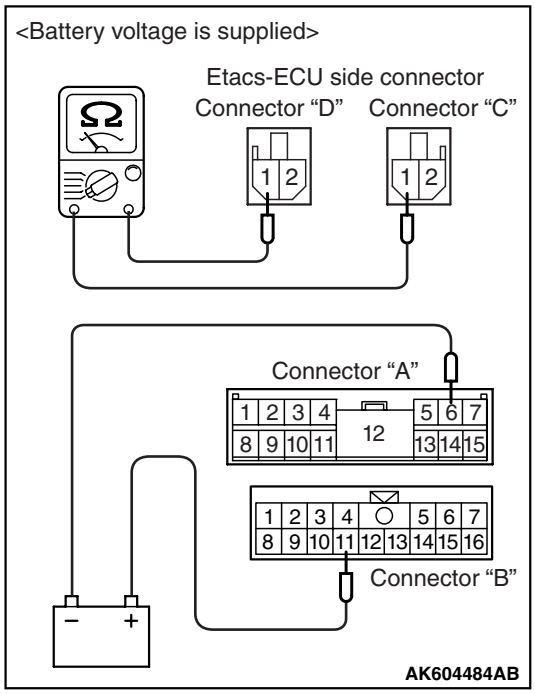
FUEL PUMP RELAY CONTINUITY CHECK

M1131033001129

Inspect the fuel pump relay for continuity in accordance with the chart shown below.

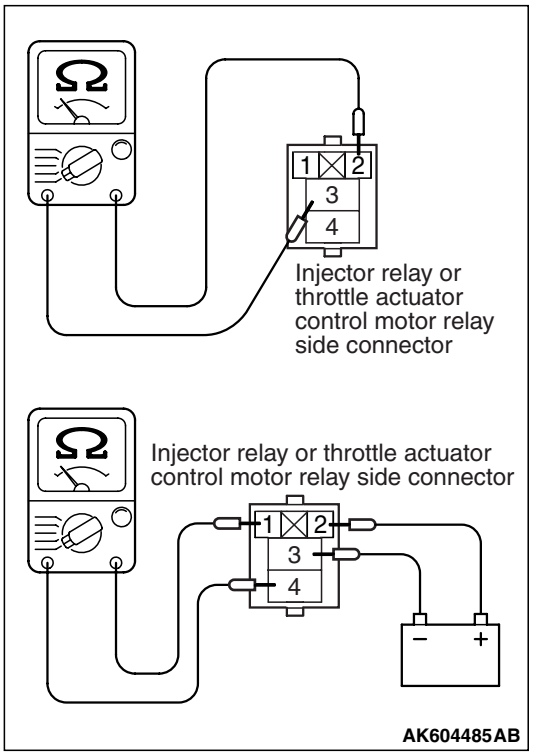
BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	6 (Connector "A") – 11 (Connector "B")
Supplied	6 (Connector "A") –11 (Connector "B")	1 (Connector "C") – 1 (Connector "D")





INJECTOR RELAY AND THROTTLE ACTUATOR CONTROL MOTOR RELAY CONTINUITY CHECK

M1131054700012

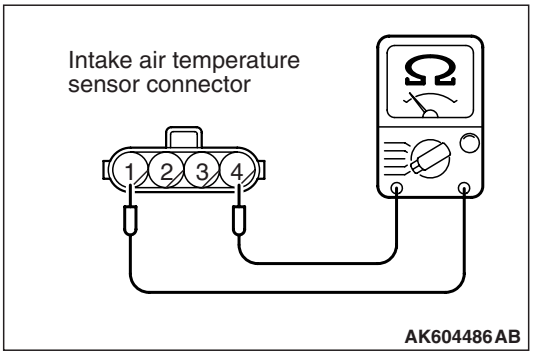


Inspect the Injector relay and throttle actuator control motor relay for continuity in accordance with the chart shown below.

BATTERY VOLTAGE	TERMINAL NO. TO BE CONNECTED TO BATTERY	TERMINAL NO. TO BE CONDUCTED
Not supplied	–	1 –2
Supplied	1 –2	3 –4

INTAKE AIR TEMPERATURE SENSOR CHECK

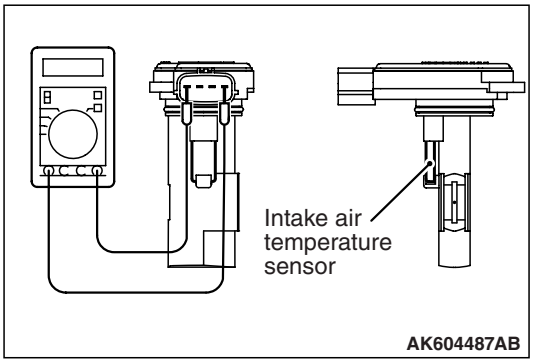
M1131002801367



1. Disconnect the mass airflow sensor connectors.
2. Measure resistance between terminals 1 and 4.

Standard value:

13 –17 kΩ [at -20° C (-4° F)]
5.3 –6.7 kΩ [at 0° C (32° F)]
2.3 –3.0 kΩ [at 20° C (68° F)]
1.0 –1.5 kΩ [at 40° C (104° F)]
0.56 –0.76 kΩ [at 60° C (140° F)]
0.30 –0.45 kΩ [at 80° C (176° F)]



3. If not within specifications, replace the mass airflow sensor.
4. Measure resistance while heating the sensor using a hair dryer.

Normal condition:

TEMPERATURE	RESISTANCE (kΩ)
Higher	Smaller

5. If resistance does not decrease as heat increases, replace the mass airflow sensor.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

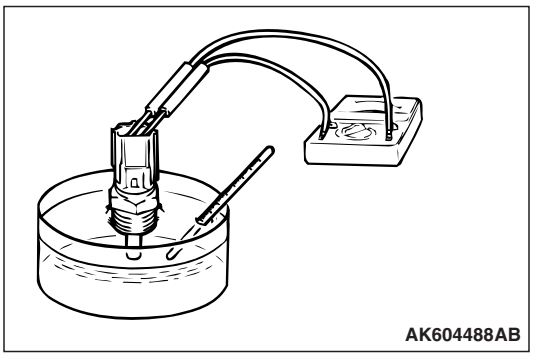
M1131003101349

⚠ CAUTION

Be careful not to touch the connector (resin section) with the tool when removing and installing.

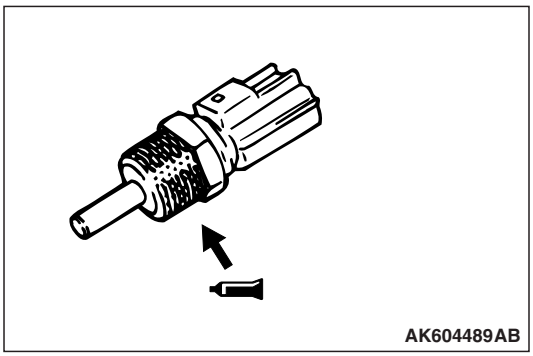
1. Drain engine coolant, then remove the engine coolant temperature sensor.
2. With the temperature sensing portion of engine coolant temperature sensor immersed in hot water, check the resistance.

   Standard value:
   14 – 17 kΩ [at -20° C (-4° F)]
   5.1 – 6.5 kΩ [at 0° C (32° F)]
   2.1 – 2.7 kΩ [at 20° C (68° F)]
   0.9 – 1.3 kΩ [at 40° C (104° F)
   0.48 – 0.68 kΩ [at 60° C (140° F)]
   0.26 – 0.36 kΩ [at 80° C (176° F)]


AK604488AB

3. If resistance deviates from the standard value greatly, replace the sensor.
4. Apply LOCTITE 262 or equivalent to threaded portion.
5. Install the engine coolant temperature sensor and tighten it to the specified torque.

   Tightening torque: 30 ±9 N· m (22 ±6 ft-lb)

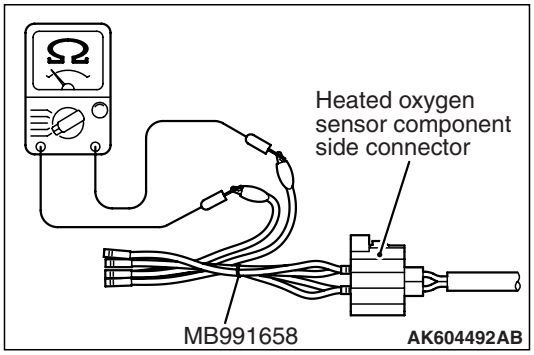

AK604489AB

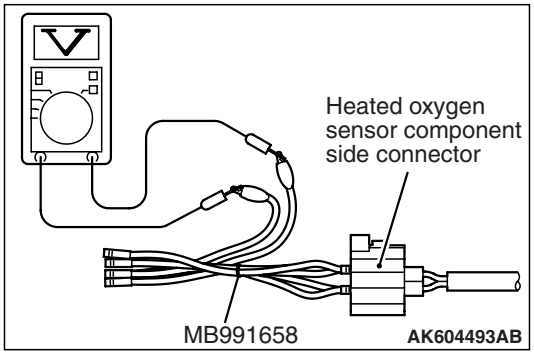
HEATED OXYGEN SENSOR CHECK

M1131005001898

Required Special Tools:

- MB991958: Scan tool (M.U.T.-III Sub Assembly)
  - MB991824: V.C.I.
  - MB991827: USB Cable
  - MB991910: Main Harness A
- MB991316: Test Harness
- MB991658: Test Harness





Heated oxygen sensor (front) <Except for California>

1. Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5-8.0 Ω at 20° C (68° F)] between terminal No. 1 and terminal No. 2 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80° C (176° F) or higher.
5. Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
6. Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
7. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 –1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 –1.0 V.

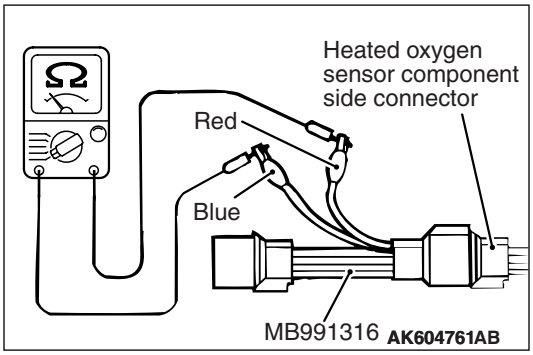
⚠ CAUTION

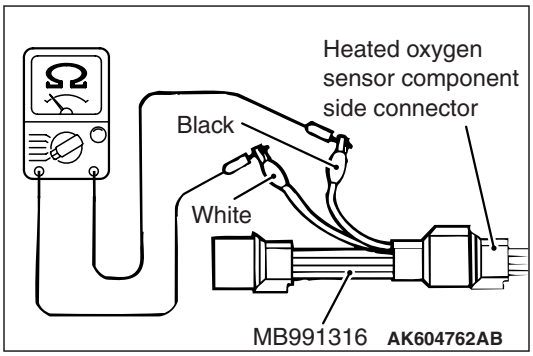
- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8V is applied to the oxygen sensor heater.**

NOTE: If the sufficiently high temperature (of approximate 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 and terminal No. 2 of the oxygen sensor with a (+) terminal and (-) terminal of 8 V power supply respectively, then check again.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler – Removal and installation P.15-12.





Heated oxygen sensor (front) <California>

1. Disconnect the heated oxygen sensor connector and connect special tool MB991316 to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5-8.0 Ω at 20° C (68° F)] between terminal No. 1 (red clip) and terminal No. 3 (blue clip) on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80° C (176° F) or higher.
5. Rev the engine for 5 minutes or more with the engine speed of 2,500 r/min.
6. Connect a digital voltage meter between terminal No. 2 (black clip) and terminal No. 4 (white clip).
7. While repeatedly revving the engine, measure the heated oxygen sensor output voltage.

   Standard value:

ENGINE	HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
When revving engine	0.6 –1.0 V	If you make the air/fuel ratio rich by revving the engine repeatedly, a normal heated oxygen sensor will output a voltage of 0.6 –1.0 V.

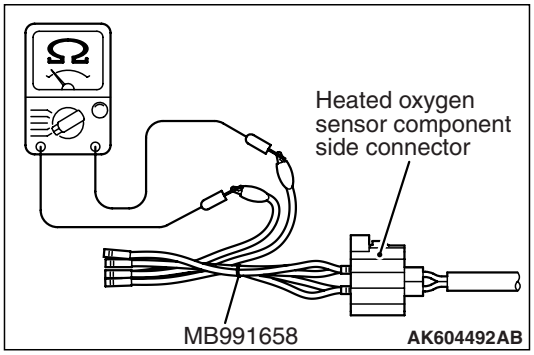
⚠ CAUTION

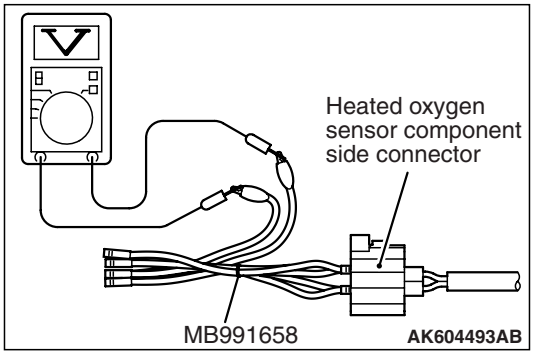
- **Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.**
- **Be careful the heater is broken when voltage of beyond 8V is applied to the oxygen sensor heater.**

NOTE: If the sufficiently high temperature (of approximate 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 (red clip of special tool) and terminal No. 3 (blue clip of special tool) of the oxygen sensor with a (+) terminal and (-) terminal of 8 V power supply respectively, then check again.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler – Removal and installation P.15-12.





Heated oxygen sensor (rear) <Except for California>

1. Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 –8.0 Ω at 20° C (68° F)] between terminal No. 1 and terminal No. 2 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80° C (176° F) or higher.
5. Drive at 50 km/h (31 mph) or more for 10 minutes.
6. Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: 2nd (5 positions CVT: "L" range)
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

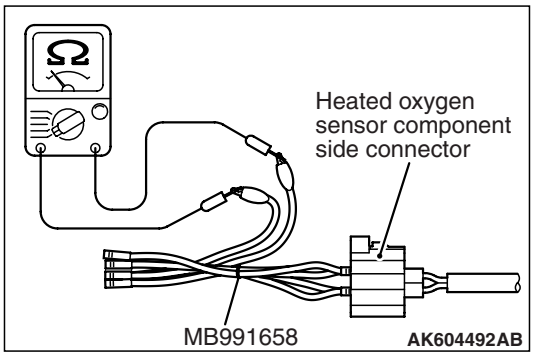
   Standard value:

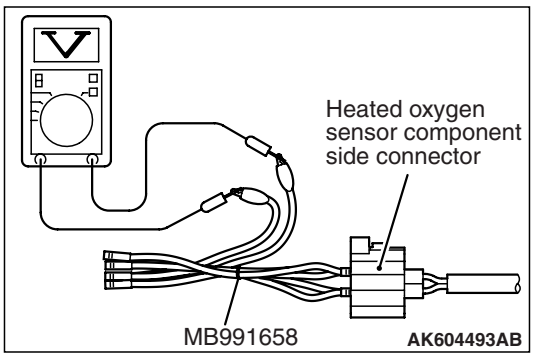
HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 –1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 0.6 –1.0 V.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: If the sufficiently high temperature (of approximate 400° C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 and terminal No. 2 of the oxygen sensor with a (+) terminal and (-) terminal of 8 V power supply respectively, then check again.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler – Removal and installation P.15-12.





Heated oxygen sensor (rear) <California>

1. Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [4.5 –8.0 Ω at 20° C (68° F)] between terminal No. 1 and terminal No. 2 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80° C (176° F) or higher.
5. Drive at 50 km/h (31 mph) or more for 10 minutes.
6. Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: 2nd (5 positions CVT: "L" range)
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

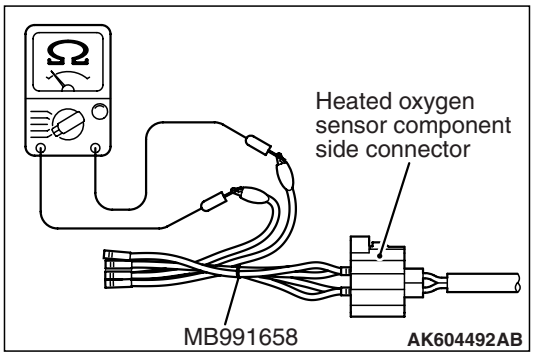
   Standard value:

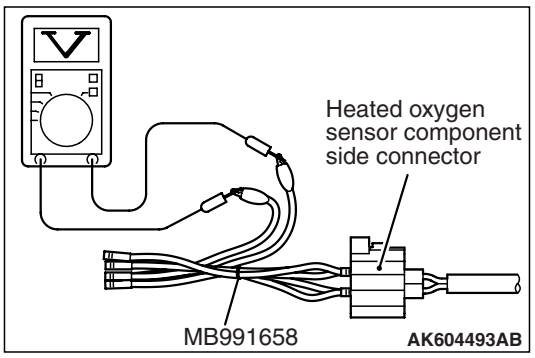
HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 –1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 0.6 –1.0 V.

8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: If the sufficiently high temperature (of approximate 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio. Therefore, if the output voltage is low, use a jumper wire to connect terminal No. 1 and terminal No. 2 of the oxygen sensor with a (+) terminal and (-) terminal of 8 V power supply respectively, then check again.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler – Removal and installation P.15-12.





Heated oxygen sensor (3rd) <California>

1. Disconnect the heated oxygen sensor connector and connect special tool MB991658 to the connector on the heated oxygen sensor side.
2. Make sure that there is continuity [11 –18 Ω at 20° C (68° F)] between terminal No. 1 and terminal No. 2 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80° C (176° F) or higher.
5. Drive at 50 km/h (31 mph) or more for 10 minutes.
6. Connect a digital voltage meter between terminal No. 3 and terminal No. 4.
7. Measure the output voltage of the heated oxygen sensor under the following driving.
   - Transaxle: 2nd (5 positions CVT: "L" range)
   - Drive with wide open throttle
   - Engine: 3,500 r/min or more

   Standard value:

HEATED OXYGEN SENSOR OUTPUT VOLTAGE	REMARKS
0.6 –1.0 V	High load operation makes air/fuel ratio richer and normal heated oxygen sensor also can output voltage of 0.6 –1.0 V.

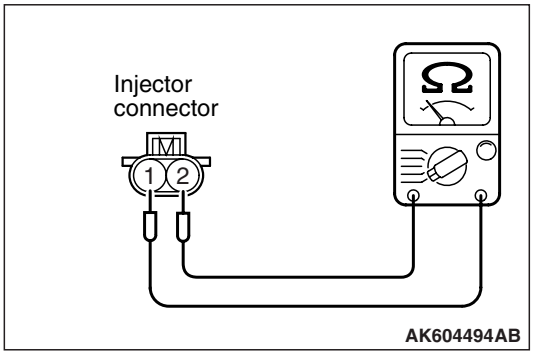
8. If the output voltage is not within the standard value, replace the heated oxygen sensor.

   NOTE: If the sufficiently high temperature (of approximate 400°C or more) is not reached although the oxygen sensor is normal, the output voltage would be possibly low although the rich air-fuel ratio.

   NOTE: For removal and installation of the heated oxygen sensor, refer to GROUP 15, Exhaust Pipe and Main Muffler – Removal and installation P.15-12.

INJECTOR CHECK

M1131005201609



1. Disconnect the injector connector.
2. Measure the resistance between injector side connector terminals 1 and 2.

   Standard value: 10.5 –13.5 ohms [at 20° C (68° F)]
3. Connect the injector connector.

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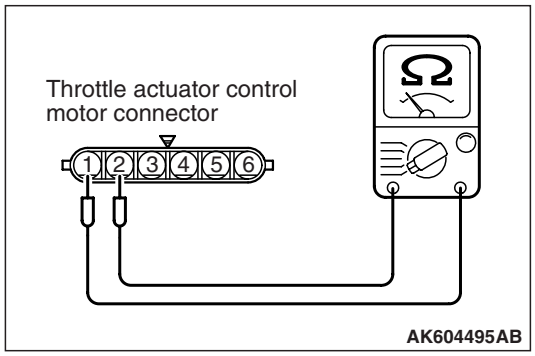
THROTTLE ACTUATOR CONTROL MOTOR CHECK

M1131051000575

<Operation Inspection>

1. Disconnect the air intake hose from the throttle body.
2. Set the ignition switch to the "ON" position.
3. Operate the accelerator pedal and confirm that the throttle valve is opening and closing accordingly.

<Checking the Terminal Resistance>



1. Disconnect the throttle position sensor connector.
2. Measure the resistance between terminal No. 1 and No. 2.

   Standard value: 0.3 –80 Ω [at 20° C (68° F)]

   NOTE: If the measured resistance deviates from the standard value, fully open the throttle valve with your finger more then five times, then check the result again. If the throttle valve control serve is not used for an extended period of time, the resistance may be increased as a result of internal forming of oxide film. Therefore, it means that the oxide film can be removed through a self cleaning capability of the throttle valve control servo, if forcibly moved.
3. If resistance is outside the standard value, replace the throttle body assembly.

ENGINE OIL CONTROL VALVE CHECK

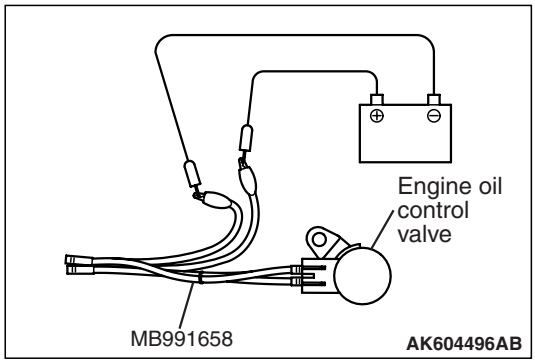
M1131053200393

Checking the Operation Sound

1. Disconnect the engine oil control valve connector.

⚠ CAUTION

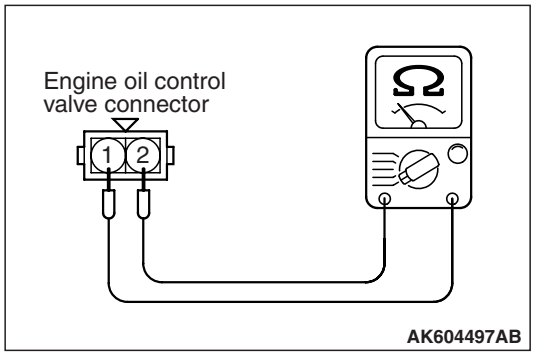
To prevent the coil from burning, keep the duration of the voltage application as short as possible.



2. Check that the operation sound of the engine oil control valve can be heard when the positive battery voltage is supplied to the engine oil control valve. (Use the jumper wires to connect terminal No. 2 of the engine oil control valve connector to the positive battery terminal and terminal No. 1 to the negative battery terminal.)
3. If the operation sound cannot be heard, replace the engine oil control valve.

Checking the Coil Resistance

1. Disconnect the engine oil control valve connector.



2. Measure resistance between terminal No. 1 and terminal No. 2 of the connector at the engine oil control valve side.
   Standard value: 6.9 –7.9 Ω [at 20° C (68° F)]
3. If resistance is not within the standard value, replace the engine oil control valve.

EVAPORATIVE EMISSION VENTILATION SOLENOID CHECK

M1131012800376

Refer to GROUP 17, Emission Control System –Evaporative Emission Canister and Fuel Tank Pressure Relief Valve – Inspection P.17-88.

EVAPORATIVE EMISSION PURGE SOLENOID CHECK

M1131005600444

Refer to GROUP 17, Emission Control System –Evaporative Emission System –Evaporative Emission Purge Solenoid Check P.17-79.

EGR VALVE CHECK <CALIFORNIA>

M1131051500149

Refer to GROUP 17, Emission Control System –Exhaust Gas Recirculation (EGR) System –EGR Valve (Stepper Motor) Check P.17-82.

INJECTOR

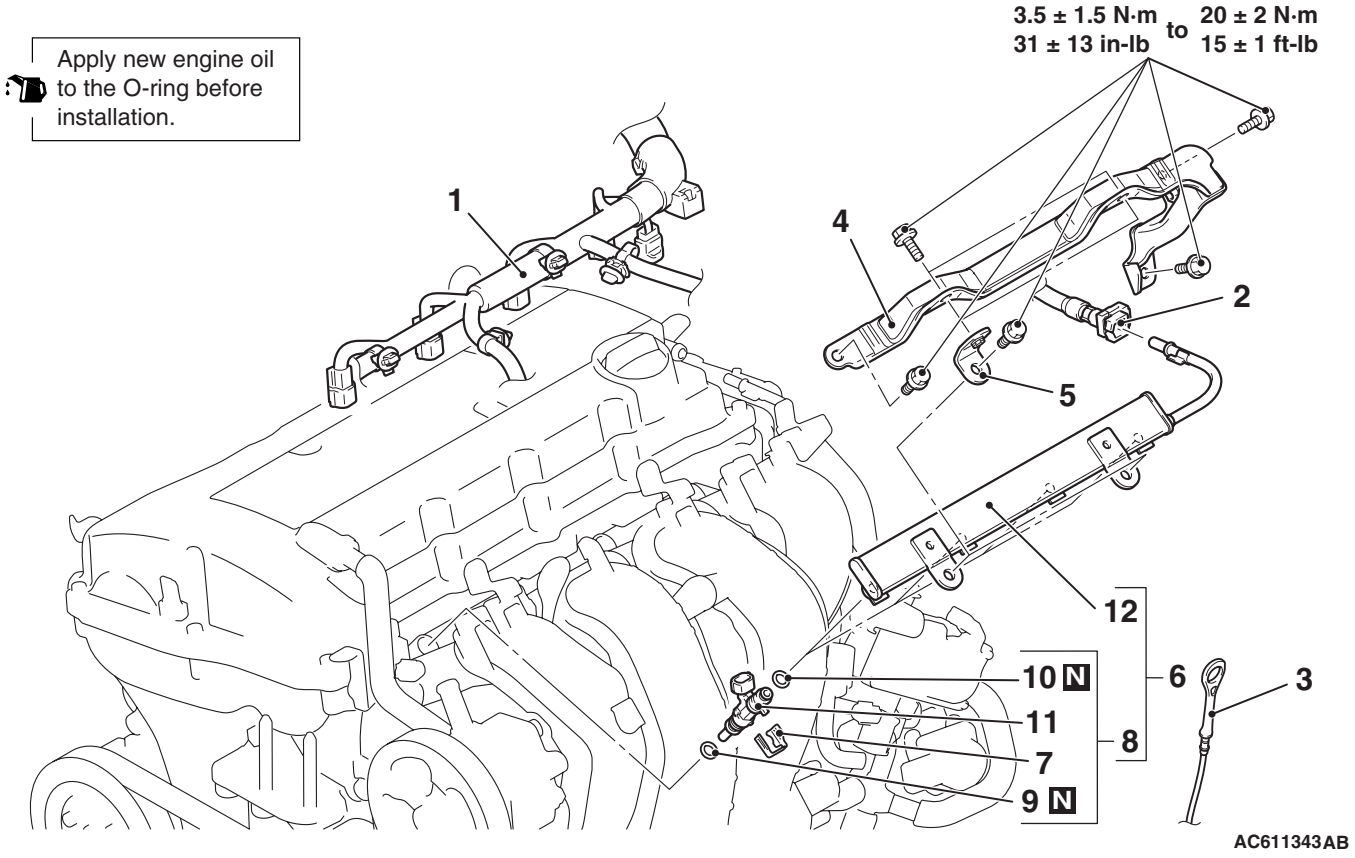
REMOVAL AND INSTALLATION

M1131007101943

⚠ CAUTION

When the fuel injector is replaced, initialize the learned value using scan tool (Refer to GROUP 00 – Precautions before Service, and Initialization Procedure of MFI Engine Learned Value P.00-30).

Pre-removal operation	Post-installation operation
• Fuel Pump Connector Disconnection (How to Reduce Pressurized Fuel Lines) (Refer to P.13A-932). • Engine Upper Cover Removal (Refer to GROUP 11A – Camshaft P.11A-22). • Air Cleaner Intake Hose Removal (Refer to GROUP 15 – Air Cleaner P.15-4).	• Air Cleaner Intake Hose Installation (Refer to GROUP 15 – Air Cleaner P.15-4). • Fuel Leak Check • Engine Upper Cover Installation (Refer to GROUP 11A – Camshaft P.11A-22).



Removal steps

	1.	Control wiring harness connection
<<A>>	>>F<<	2. Fuel high-pressure hose connection
		3. Engine oil dipstick
	>>E<<	4. Injector protector rear
	>>E<<	5. Bracket
	>>E<<	6. Fuel rail and fuel injector assembly

Removal steps (Continued)

>>D<<	7.	Fuel injector support
>>C<<	8.	Fuel injector assembly
>>B<<	9.	O-ring
>>A<<	10.	O-ring
	11.	Fuel injector
	12.	Fuel rail

Required Special Tool:

- MB992106: O-ring Installer

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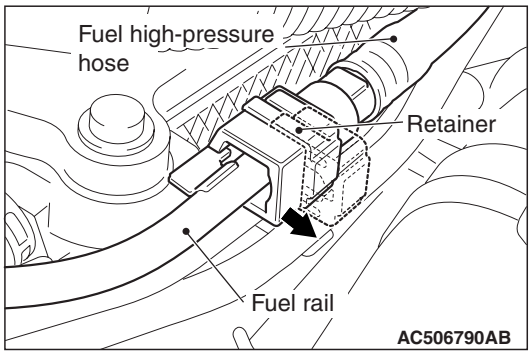
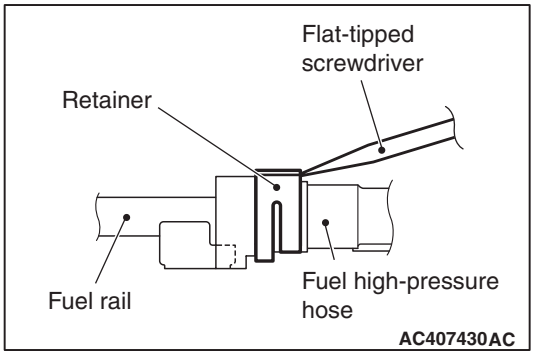
REMOVAL SERVICE POINT

<<A>> FUEL HIGH-PRESSURE HOSE DISCONNECTION



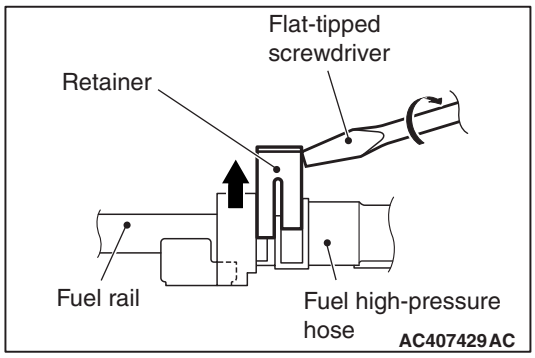
1. Follow the steps below to unlock the fuel high-pressure hose connector.



(1) Insert a flat-tipped screwdriver [6 mm (0.24 inch) wide and 1 mm (0.04inch) thick] into the retainer of the fuel high-pressure hose connector.

⚠ CAUTION

When pushing up the retainer of the fuel high-pressure hose connector, pay attention to avoid damage to the retainer.

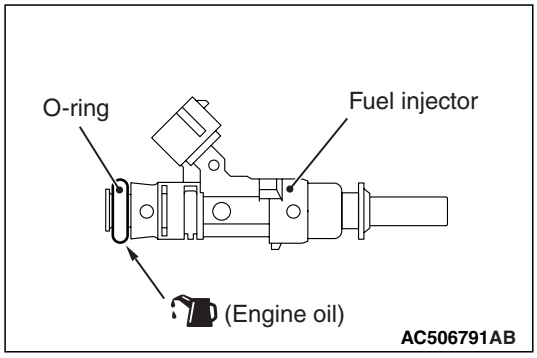


(2) Turn the flat-tipped screwdriver inserted into the retainer by 90 degrees to push up the retainer and unlock the fuel high-pressure hose connector.

2. Remove the fuel high-pressure hose.

INSTALLATION SERVICE POINTS

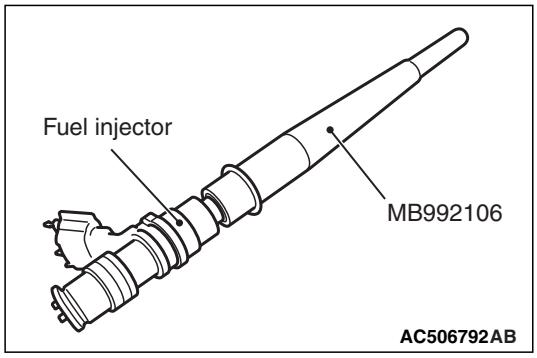
>>A<< O-RING INSTALLATION



1. Apply a small amount of new engine oil to the O-ring.
2. While turning the fuel injector to right and left, install the O-ring to the fuel injector with care to avoid damage to the O-ring.

>>B<< O-RING INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.



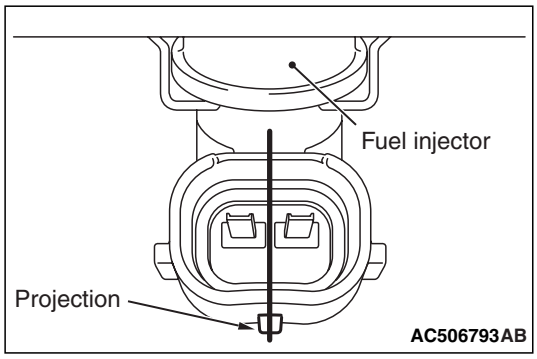
2. Using special tool MB992106, install the o-ring onto the fuel injector paying attention to avoid damage to the O-ring.

>>C<< FUEL INJECTOR ASSEMBLY INSTALLATION

⚠ CAUTION

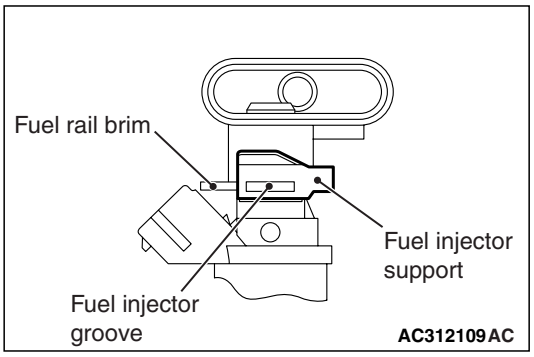
When applying the engine oil, make sure not to allow the engine oil to enter the fuel rail inside.

1. Apply a small amount of new engine oil to the O-ring.
2. Turning the fuel injector assembly to right and left, install it to the fuel rail with care not to damage the O-ring. After the installation, check for its smooth rotation. At this time, check that the projection of the fuel injector assembly is in the center.
3. If the rotation is not smooth, the O-ring may be caught. Remove the fuel injector assembly and check the O-ring for damage. After this, re-insert it to the fuel rail and check for its smooth rotation.



>>D<< FUEL INJECTOR SUPPORT INSTALLATION

Install the fuel injector support to the fuel injector groove and fuel rail flange, and fix the fuel injector assembly and fuel rail.

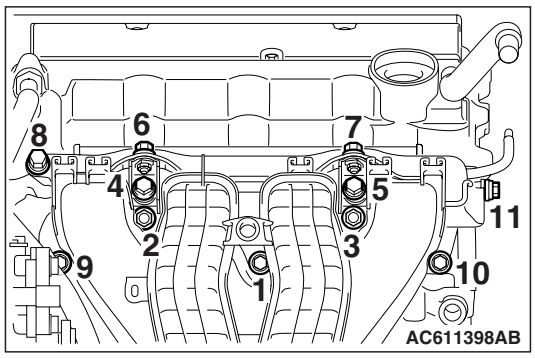


>>E<< FUEL RAIL AND FUEL INJECTOR ASSEMBLY/BRACKET/INJECTOR PROTECTOR REAR INSTALLATION

⚠ CAUTION

When applying the engine oil, make sure not to allow the engine oil to enter the intake manifold inside.

1. Apply a small amount of new engine oil to the O-ring at the end of fuel injector assembly.



⚠ CAUTION

When installing the fuel rail and fuel injector assembly to the intake manifold, pay attention to avoid damage to the O-ring at the end of the fuel injector assembly.

2. Install the fuel rail and fuel injector assembly to the intake manifold.
3. Install the bracket and injector protector rear.
4. Loosen the intake manifold mounting bolts and nuts. (Bolts and nuts 1, 2, 3, and 9 shown in the figure)
5. Remove the EGR valve. (Refer to GROUP 17 –Exhaust Gas Recirculation (EGR) valve P.17-85.) <Vehicles for California>
6. Loosen the intake manifold stay B and intake manifold coupling bolts. (Refer to GROUP 15 –Intake Manifold P.15-5.) <Except for California>
7. Loosen the EGR valve support and intake manifold coupling bolts. (Refer to GROUP 17 –Exhaust Gas Recirculation (EGR) valve P.17-85.) <Vehicles for California>
8. Loosen the intake manifold stay mounting bolts. (Refer to GROUP 15 –Intake Manifold P.15-5.)
9. Temporarily tighten the mounting bolts of the fuel rail, and the mounting bolts and nuts of the bracket, injector protector rear, and intake manifold to the specified torque of 3.5 ±1.5 N· m (31 ±13 in-lb) in the order of number shown in the figure. (Bolts 4, 5, 6, 7, 8, 10, 11)
10. Temporarily tighten the mounting bolts of the fuel rail, and then mounting bolts and nuts of the bracket, injector protector rear, and intake manifold to the specified torque of 20 ±2 N· m (15 ±1 ft-lb) in the order of number shown in the figure. (Bolts 4, 5, 6, 7, 8, 10, 11)
11. Tighten the intake manifold stay to the specified torque.

    Tightening torque: 20 ±2 N· m (15 ±1 ft-lb)

12. Tighten the intake manifold stay B and intake manifold coupling bolts to the specified torque. <Except for California>

    Tightening torque: 20 ±2 N· m (15 ±1 ft-lb)

13. Tighten the EGR valve support and intake manifold coupling bolts to the specified torque. <Vehicles for California>

    Tightening torque: 20 ±2 N· m (15 ±1 ft-lb)

14. Install the EGR valve. (Refer to GROUP 17 –Exhaust Gas Recirculation (EGR) valve P.17-85.) <Vehicles for California>

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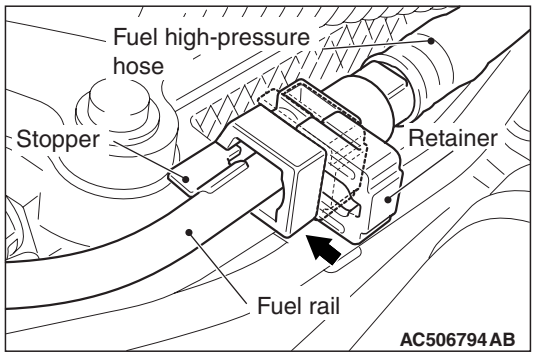
>>F<< FUEL HIGH-PRESSURE HOSE CONNECTION

⚠ CAUTION

- **When pushing in the retainer of the fuel high-pressure hose connector, pay attention to avoid damage to the retainer.**
- **After the installation of the fuel high-pressure hose, slightly pull the fuel high-pressure hose to check that it is connected securely. At this time, also check that there is approximately 1 mm (0.04inch) play.**



1. Securely insert the fuel rail stopper into the fuel high-pressure hose connector groove to install the fuel high-pressure hose to the fuel rail.
2. Push in the retainer of the fuel high-pressure hose connector to lock the fuel high-pressure hose and fuel rail.

THROTTLE BODY ASSEMBLY

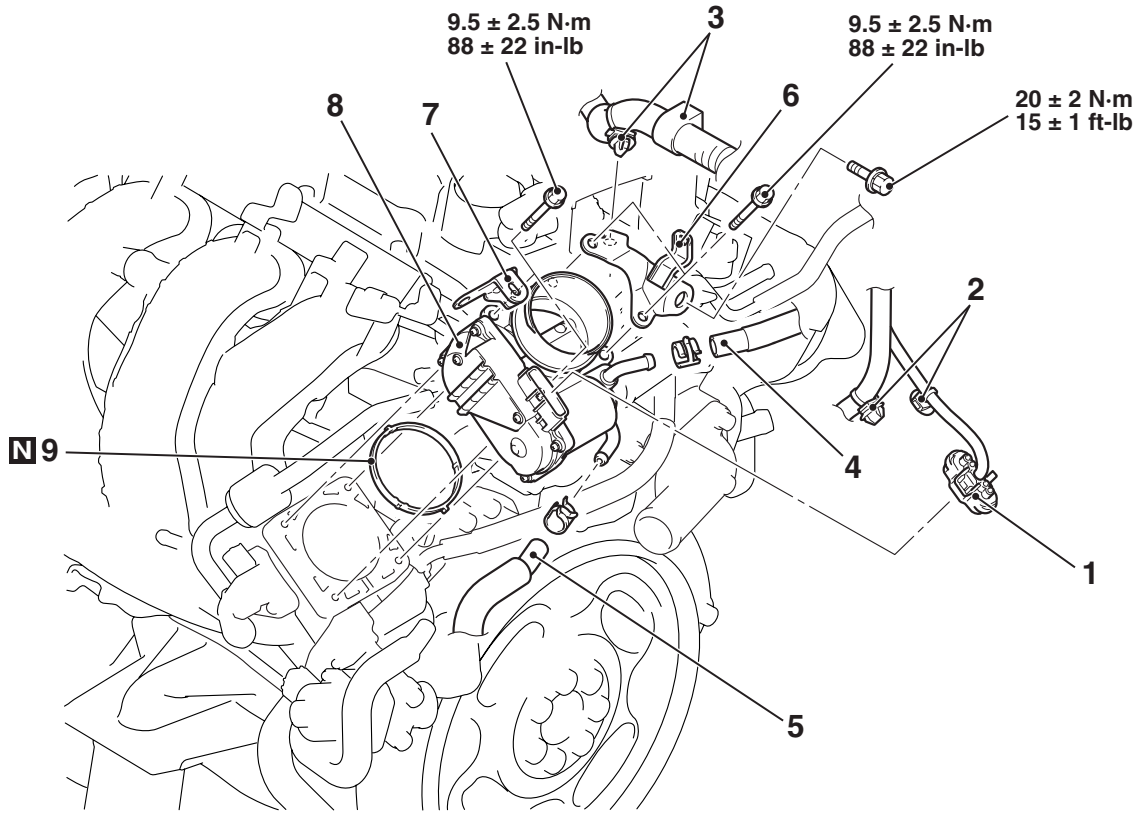
REMOVAL AND INSTALLATION

M1131007701699

⚠ CAUTION

- **When the throttle body assembly is replaced, initialize the learned value using scan tool (Refer to GROUP 00 –Precautions before Service, and Initialization Procedure of MFI Engine Learned Value P.00-30).**
- **Never loosen the screw fixing the throttle body assembly resin cover. If the screw is loosened, the sensor incorporated in the resin cover is misaligned and the throttle body assembly does not work normally.**

Pre-removal operation	Post-installation operation
• Engine Upper Cover Removal (Refer to GROUP 11A – Camshaft P.11A-22). • Engine Coolant Draining (Refer to GROUP 14 –On-vehicle Service, Engine Coolant Replacement P.14-13). • Air Cleaner Intake Hose Removal (Refer to GROUP 15 – Air Cleaner P.15-4).	• Air Cleaner Intake Hose Installation (Refer to GROUP 15 – Air Cleaner P.15-4). • Engine Coolant Refilling (Refer to GROUP 14 –On-vehicle Service, Engine Coolant Replacement P.14-13). • Engine Upper Cover Installation (Refer to GROUP 11A – Camshaft P.11A-22).



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Removal steps

>>B<< • Initialization operation (only at installation)
1. Throttle body assembly connector
2. Control wiring harness clamp connection
3. Battery wiring harness clamp connection
4. Throttle body water feed hose connection

Removal steps (Continued)

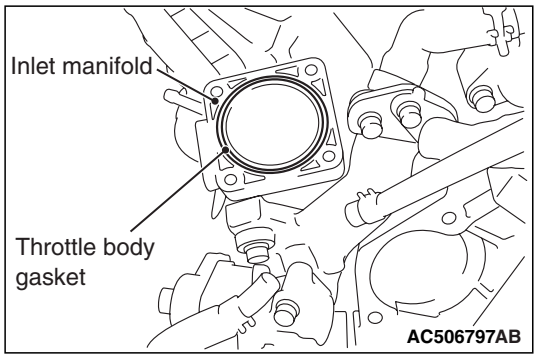
5. Throttle body water return hose connection
6. Throttle body stay
7. Throttle body wiring harness connector bracket
8. Throttle body assembly

>>A<< 9. Throttle body gasket

TSB Revision

INSTALLATION SERVICE POINTS

>>A<< THROTTLE BODY GASKET INSTALLATION



Fit the throttle body gasket in the inlet manifold groove securely with neither twisting nor damage given.

>>B<< INITIALIZATION OPERATION

Turn the ignition switch to the "ON" and then to "LOCK" (OFF) position and hold it for at least 10 seconds.

ENGINE CONTROL MODULE (ECM)

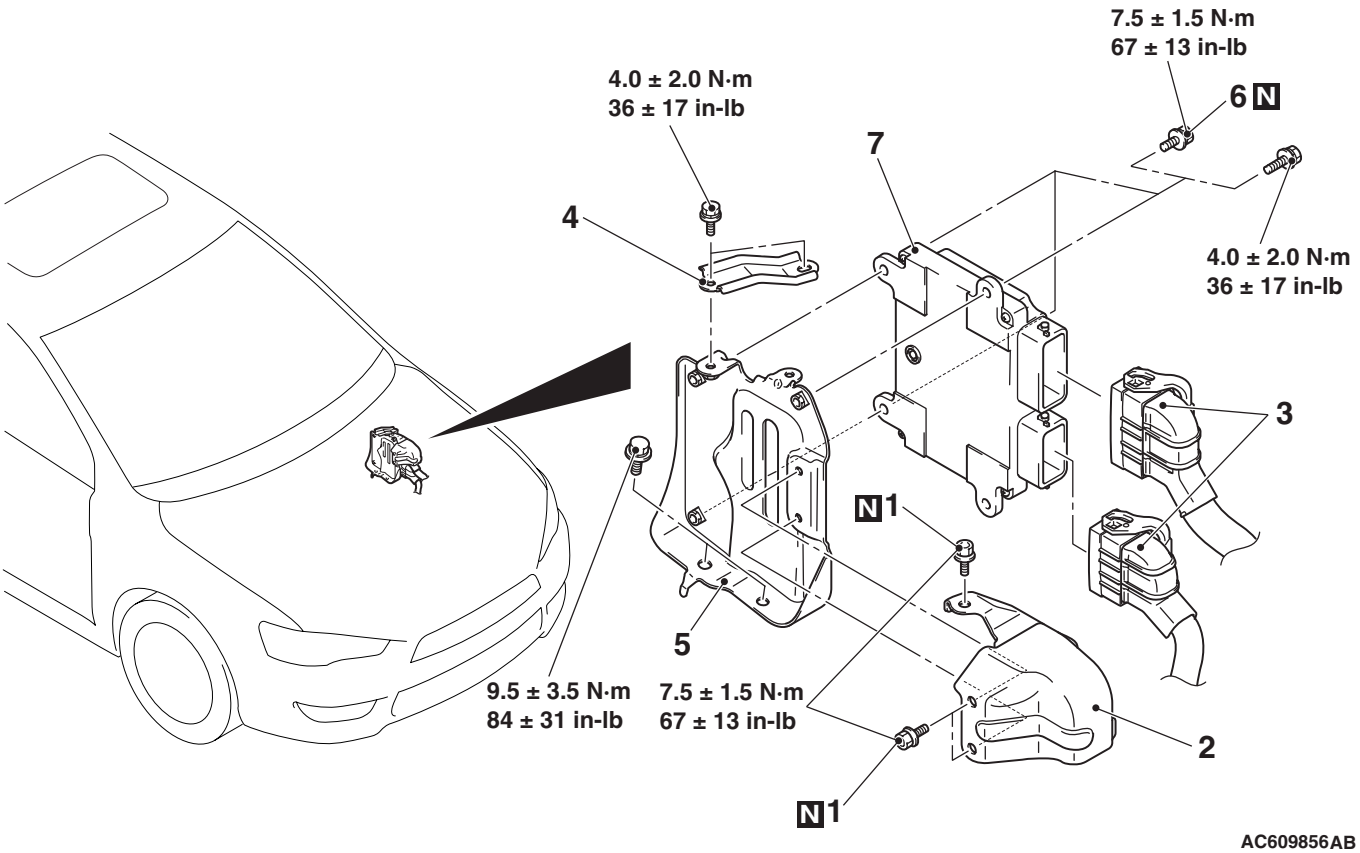
REMOVAL AND INSTALLATION

M1131033800478

⚠ CAUTION

- **When the ECM is replaced, do not replace the immobilizer ECU (WCM) or KOS-ECU simultaneously. When multiple ECUs are to be replaced, always replace only one ECU at a time and complete necessary ID registration using scan tool (Refer to GROUP 42B –Troubleshooting, ID Code Registration Necessity Judgement Table P.42B-13) <Vehicle with KOS installed> (Refer to GROUP 42C –Troubleshooting, ID Code Registration Necessity Judgement Table P.42C-8) <Vehicle with WCM installed>.**
- **After the ECM replacement, idling speed may be unstable because the MFI engine learning is not completed. To make it stable, let the system learn the idling (Refer to GROUP 00 –Precautions before Service, Learning Procedure for Idling in MFI Engine P.00-31).**
- **After the replacement of the ECM, register a key code using scan tool [Refer to GROUP 00 –Precautions before Service, How to Perform Vehicle Identification Number (VIN) Writing P.00-26].**
- **For replacement of the ECM, use an ECM for which the vehicle identification number entry and coding are completed. If diagnosis code No. P0630 vehicle identification number-related or No. P1676 variant coding-related is set in the ECM, replace it with an ECM to which the same vehicle identification number has been entered and the same coding has been made as for the relevant vehicle.**

Pre-removal and post-installation operation
- Air Cleaner Assembly Removal and Installation (Refer to GROUP 15 –Air Cleaner P.15-4).



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Removal steps

>>B<< • Initialization operation (only at installation)

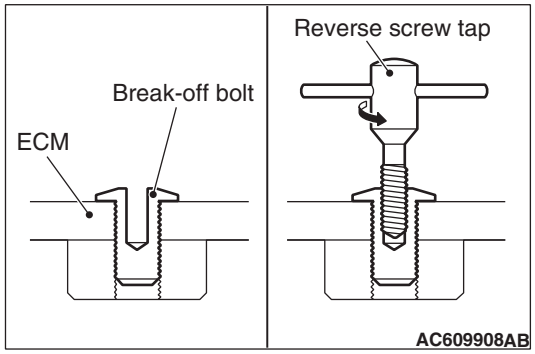
<<A>> >>A<< 1. Break-off bolts <vehicles for Canada>
2. ECM connector cover <vehicles for Canada>
3. ECM connector

Removal steps (Continued)

<<A>> >>A<< 4. ECM stay
5. ECM bracket
6. Break-off bolts <vehicles for Canada>
7. ECM

REMOVAL SERVICE POINT

<<A>> BREAK-OFF BOLTS REMOVAL <VEHICLES FOR CANADA>



1. Drill in the break-off bolt a hole deep enough for the tap to stand.
2. Remove the break-off bolt with a left-hand tap.

INSTALLATION SERVICE POINTS

>>A<< BREAK-OFF BOLTS INSTALLATION <VEHICLES FOR CANADA>

Tighten until the head of break-off bolt is broken off.

>>B<< INITIALIZATION OPERATION

Turn the ignition switch to the "ON" and then to "LOCK" (OFF) position and hold it for at least 10 seconds.

NOTES